

Remedial Investigation Report For 903 Pad, Mound, and East Trenches Areas

Volume VI

U.S. DEPARTMENT OF ENERGY

Rocky Flats Plant Golden, Colorado

31 December 1987



By F. J. Curran	1
Date 4-/- 9/	

UNITED STATES DEPARTMENT OF ENERGY
ADMINISTRATION CONTRACT DE-AC04-76DPO3533

A-0U02-000

APPENDIX E
HYDROGEOLOGIC DATA

Boring	No.:1_71	
Comple	ted as well? Yes	
Data in	File	
	Log of Borehole	
<u> </u>	Well Construction Summaries	
	Well Development Summaries	
	Hydraulic Conductivity Test Data	
	and Results	
	Packer Test Data and Results	
X	Water Level Data	

WELL SUMMARY

J10K

903 PAD AREA

	Well Name:
Elev. of Ground: <u>5950</u>	Elev. of Top of Casing: <u>5950.</u> 8
Coordinates: <u>N35833.88</u>	E 33205.49
Date of Construction: 1971	Constructed By:
Available Information	
Geologic Log: NO	Geophysical Log: No
/ -	Permeability Test: 113
Water Level Data: 13,25 16:10	Water Quality Data: 3/22/83
Condition of Surface	
Internal Casing	
Material: STEER	
Internal Diameter:	
Outside Diameter: 68	
Total Depth: 3005	
Stick-Up: 0.85'	
Condition: RUST 4	MAGE (10 } HATE)
Protective Casing	
Material:	
Internal Diameter:	
Outside Diameter:	
Total Depth:	
Stick-Up:	
Locked: NO	
Condition:	
Surface Seal:	

12/11/87

Water Level Data

Rockwell (Rocky Flats)

Date Measured	Depth to Water from TOC	Elevation TOC (ft)	Water Level Elev. (ft)
			A-10-10-10-10-10-10-10-10-10-10-10-10-10-
** Well Numbe	r: 0171		
08/25/86	13.04	5950.83	5937. 79
08/27/86	13.35	5950.83	5937.48
12/01/87	15.13	5950.83	5935.70

Boring	No.: 2-71
Comple	ted as well? Yes
Data in	File
	Log of Borehole
<u>X</u> :	Well Construction Summaries
	Well Development Summaries
	Hydraulic Conductivity Test Data
	and Results
	Packer Test Data and Results
<u> </u>	Water Level Data

903 PAD AREA

	well Name:
Elev. of Ground: <u>5936. 3</u>	Elev. of Top of Casing: 5936.7
Coordinates: <u>N35528.12</u>	E aa831.33
Date of Construction:	Constructed By:
Available Information	
Geologic Log: NO	Geophysical Log: YES
Construction Details: NO	Permeability Test: No
Water Level Data:	Water Quality Data: ?
Condition of Surface	
Internal Casing	
Material: 57562	
Internal Diameter:	
Outside Diameter:	
Total Depth: 29.23/	
Stick-Up: 0.59	
Condition: RUST? 7	MNGE IN 7 HOSP
Protective Casing	
Material: MO	
Internal Diameter:	
Outside Diameter:	
Total Depth:	
Stick-Up:	
Locked: NO	
Condition:	
Surface Seal: NO	

12/11/87

Water Level Data for

Rockwell (Rocky Flats)

Measured	from TOC	TOC (ft)	Elev. (ft)
** Well Number	: 0271		
08/25/86 08/27/86 12/01/87	10.10 26.55 8.92	5936.79 5936.79 5936.79	5926.69 5910.24 5927.87

Boring	No.: 1-74
Comple	ted as well? Yes
Data in	File
	Log of Borehole
<u> </u>	Well Construction Summaries
	Well Development Summaries
<u> X</u>	Hydraulic Conductivity Test Data
	and Results
	Packer Test Data and Results
X	Water Level Data

WELL SUMMARY

J10K

MOUND AREA

10 2-11		We'll Name: $\omega = 1 - 34$
P-3-66	Elev. of Ground: 5966.0	Elev. of Top of Casing:
.	Coordinates: N36643.8 E 23	069.0
	Date of Construction:	Constructed By:
	Available Information	
	Geologic Log: YES (ATTACETE)	Geophysical Log:
	Construction Details: NO	Permeability Test: YES
1.40' 14:	Water Level Data: 14.44	Water Quality Data: 16:17 3/22/85
	Condition of Surface	
	Internal Casing	
ALV. SPER	n Material: PVC	
-638'	Internal Diameter:	
65"	Outside Diameter: $64''$	
46.30	Total Depth: 24.96	
146.30	Stick-Up: 40.80	
(1000)	Condition: Good Sci6Hazy	DRTS HAS SLIP ON LID
•		
244./3095c	Protective Casing	
et sant	Material: STEEC	
	Internal Diameter:	*
	Outside Diameter:	
-	Total Depth:	
	Stick-Up:/, 5 8	· •
NO N SLIP S	Locked: NO HINGED CO	UER POCK UN TOP
	Condition:	AUGR
HONB	Surface Seal: CIRCULAR CONU	RETE PADS - GOOD
	\sim	

Langton of inflow = 24.16-14.23 = 9.33' Su Sketch

using This too now ided for entiry else.

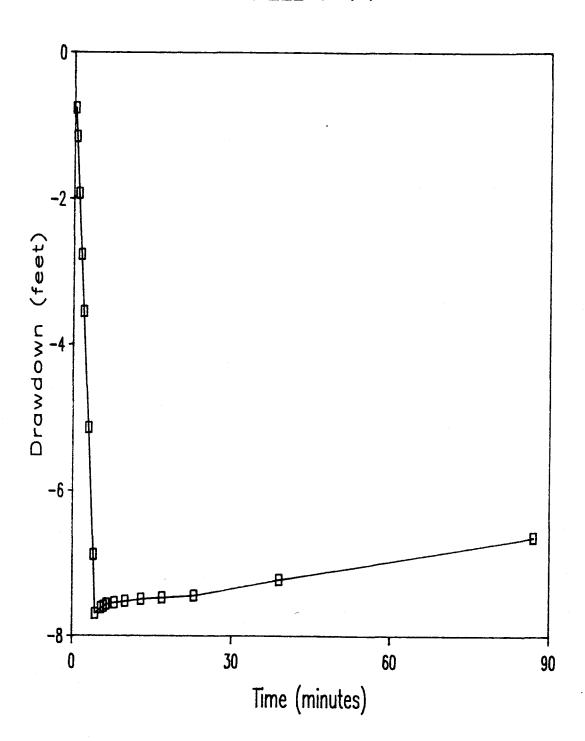
WELL 1-74

Time (minutes)
Drawdown (feet)

-	0	OPump at 2.53 gpm
9	.25	.76
	.5	1.15
_	1	1.93
)	1.5	2.77
•	2	3.55
	3	5.14
	4	6.88
9.934	4.38	7.69
9 93 x 3 5	5.5	7.61Cease Pumping
8.64 "	- 6	7 . 59
8.60 "	6.5	7.56
5,82	- 8	7.54
4.25×		7.52
•	13	7.49
3,27	17	7.47
2.46	23	7.44
	/ 39	7.22 .
1.9 "	87	6.64
'		
1.95		
1.50		

Kang = 4.0 x155 c/rc.

WELL 1-74



12/11/87

Water Level Data for Rockwell (Rocky Flats)

Date	Depth to Water from TOC	Elevation	Water Level
Measured		TOC (ft)	Elev. (ft)
** Well Number:	: 0174		
08/20/86	18.23	5968.00	5949.77
08/25/86	18.60	5968.00	5949.40
08/26/86	20.81	5968.00	5947.19
12/01/87	13.64	5968.00	5954.36

Boring	No.: 3-74
Comple	ted as well? Yes
Data in	File
	Log of Borehole
X_	Well Construction Summaries
	Well Development Summaries
	Hydraulic Conductivity Test Data
	and Results
	Packer Test Data and Results
X	Water Level Data

WELL SUMMARY

J10K

EAST TRENCHES AREA

v. of Top of Casing:
structed By:
physical Log:
meability Test:
er Quality Data:
3 3/A//83
PIC
Tere
•
4 HASP
USFY
10 00 1 ===
AD CRACK ON 5' S.W. SIDES

12/11/87

Water Level Data for Rockwell (Rocky Flats)

Date	Depth to Water	Elevation	Water Level
Measured	from TOC	TOC (ft)	Elev. (ft)
** Well Number	. 0374	na nguyan na na maganin kanan na na nagan na n	
08/20/86	21.56	5820.16	5798.60
08/25/86	21.61	5820.16	5798.55
12/01/87	21.23	5820.16	5798.93

Boring	No.: 7-74
Comple	ted as well? Yes
Data in	File
	Log of Borehole
<u>_x</u>	Well Construction Summaries
	Well Development Summaries
	Hydraulic Conductivity Test Data
	and Results
	Packer Test Data and Results
<u></u>	Water Level Data

WELL SUMMARY

J10K

EAST TRENCHES AREA

	Well Name:
	•
Elev. of Ground: 5940.50	Elev. of Top of Casing:
Coordinates: N30427 9 EZS	ा ः व
Date of Construction: 1974	Constructed By:
Available Information ,	
Geologic Log:	Geophysical Log:
Construction Details:	Permeability Test:
Water Level Data: 42.47'	Water Quality Data:
Condition of Surface	,
Internal Casing	
Material: # 6" SCH.	40 PVC 4 SLIP CAP
Internal Diameter: 5%"	•
Outside Diameter: 44	
Total Depth: 50.15'	
Stick-Up: 0.48	
Condition: <u>Good</u> DIR	TY
Protective Casing	
Material: THIN GAVE	STEEL
Internal Diameter:	
Outside Diameter:	
Total Depth:	
Stick-Up:	
Locked: Ko HINGEO L	10 4 HASP
Condition: Good RUSTS	DIRTY
Surface Seal: 2 6 GNCR	PAD CRACK ON
	WEST SIRE

12/11/87

Water Level Data for Rockwell (Rocky Flats)

Date	Depth to Water	Elevation	Water Level
Measured	from TOC	TOC (ft)	Elev. (ft)
** Well Numbe		5946 98	5904 75
08/22/86	40.15	5946.98	5906.83
08/20/86	40.23	5946.98	5906.75
08/22/86	40.15	5946.98	5906.83
12/01/87	40.17	5946.98	5906.81

Boring	No.: 22-74
Comple	ted as well? Yes
Data in	File
	Log of Borehole
<u>X</u>	Well Construction Summaries
	Well Development Summaries
<u>X</u>	Hydraulic Conductivity Test Data
	and Results
	Packer Test Data and Results
X	Water Level Data

WELL SUMMARY

J10K

MOUND AREA

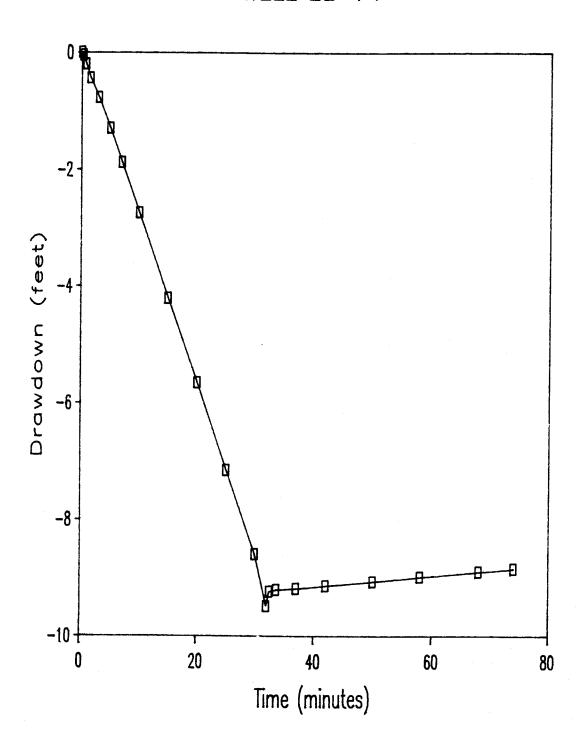
Elev. of Ground: \$954.8 Elev. of Top of Casing: Coordinates: N 30542.5 E2402.4 Date of Construction: Constructed By: Available Information Geologic Log: //> Construction Details: //> Water Level Data: Water Quality Data: 25.0 / 13.55 3/20/05 Condition of Surface Internal Casing Material: 3" SCAL 40 PVC NO CAP Internal Diameter: 3%" Outside Diameter: 3%" Total Depth: 41.05 Alosso 1999 By Corrective Casing Material: 7/1/CK GRUSE STEEL Internal Diameter: //34" SURFALE CASING Outside Diameter: //34" SURFALE CA		Well Name: $\omega 22-74$
Date of Construction: Constructed By: Available Information Geologic Log: #/3 Geophysical Log: #/5 Construction Details: #/3 Permeability Test: Water Level Data: Water Quality Data: 25.0' 13:35' 3/27/85' Condition of Surface Internal Casing Material: 3'' 5006 40 PVC NO CAP Internal Diameter: 3'' Outside Diameter: 3'' Total Depth: 41.05' a-Robbit 199 By Construction Stick-Up: 0.69' Condition: GOD Protective Casing Material: THICK GRUSE STEEL Internal Diameter: 12'' Outside Diameter: 12'' Total Depth: 2.14'? SURFACE CASING TOTAL DEPTH: 2.14'? SURFACE CA	Elev. of Ground: 5956.8	Elev. of Top of Casing:
Available Information Geologic Log: #/3 Geophysical Log: #/5 Construction Details: #/3 Permeability Test: #/5 Water Level Data: Water Quality Data: 25.0' 13:35 3/27/05 Condition of Surface Internal Casing Material: 3" SCAS 40 PVC NO CAP Internal Diameter: 3%" Outside Diameter: 3%" Total Depth: 41.05' & PLOSE 199 By CONTINE Stick-Up: O.C9 Condition: GOOD Protective Casing Material: 174/CK GOUSE STEPT Internal Diameter: 1/34" Outside Diameter: 1/34" SURFACE CASING C' XCK 40 PVC (4" O.O. 5%" I.O. 5%" I.O. 5%" I.O. NO CAP Ottal Depth: 2.14'? STEPT Stick-Up: 1.766 PVC (4" O.O. 5%" I.O. NO CAP Ottal Depth: 1.766 PVC (4" O.O. 5%" I.O. NO CAP Ottal Depth: 1.766 PVC (4" O.O. 5%" I.O. NO CAP Ottal Depth: 1.766 PVC (4" O.O. 5%" I.O. NO CAP Ottal Depth: 1.766 PVC (4" O.O. 5%" I.O. NO CAP Ottal Depth: 1.766 PVC (4" O.O. 5%" I.O. NO CAP Ottal Depth: 1.766 PVC (4" O.O. 5%" I.O. NO CAP Ottal Depth: 1.766 PVC (4" O.O. 5%" I.O. NO CAP Ottal Depth: 1.766 PVC (4" O.O. 5%" I.O. NO CAP Ottal Depth: 1.766 PVC (4" O.O. 5%" I.O. NO CAP Ottal Depth: 1.766 PVC (4" O.O. 5%" I.O. NO CAP Ottal Depth: 1.766 PVC (4" O.O. 5%" I.O. NO CAP Ottal Depth: 1.766 PVC (4" O.O. 5%" I.O. NO CAP Ottal Depth: 1.766 PVC (4" O.O. 5%" I.O. NO CAP Ottal Depth: 1.766 PVC (4" O.O. 5%" I.O. NO CAP Ottal Depth: 1.766 PVC (4" O.O. 5%" I.O. NO CAP Ottal Depth: 1.766 PVC (4" O.O. 5%" I.O. NO CAP Ottal Depth: 1.766 PVC (4" O.O. 5%" I.O. NO CAP Ottal Depth: 1.766 PVC (4" O.O. 5%" I.O. NO CAP Ottal Depth: 1.766 PVC (4" O.O. 5%" I.O. 5%"	Coordinates: N 36542.5 E 2400	2. \
Geologic Log:	Date of Construction:	Constructed By:
Construction Details: No Permeability Test: Yes Water Level Data: Water Quality Data: 25.0 13:35 3/20/85 Condition of Surface Internal Casing Material: 3'' Outside Diameter: 3'' Total Depth: 41.05 4 6082 199 87 6077333 Stick-Up: 0.69 Condition: Good Protective Casing Material: 174/CK GQUSE STEEL Internal Diameter: 1/2" Outside Diameter: 1/2" Surface CASING C" XCK 40 PVC C' XCK	Available Information	Coma News
Water Level Data: \$\int 25.0' 13:35 3 20 85\$ Condition of Surface Internal Casing Material: \$\int 3'' 5CH 40 PVC KO CAP Internal Diameter: \$\int 4!.05' \text{ \$\int 205} \$	Geologic Log: #/3	Geophysical Log: Yes
Condition of Surface Internal Casing Material: 3" SCA 40 PVC NO CAP Internal Diameter: 3%" Outside Diameter: 3%" Total Depth: 41.05" a PLOSED 199 By CONTYSTI. Stick-Up: 0.69" Condition: GOOD Protective Casing Material: THICK GRUSE STEEL Internal Diameter: 1/34" Outside Diameter: 1/2" Outside Diameter: 1/2" Total Depth: 2.14'? SURFACE CASING C/" SCA 40 PVC C/4" 0.0. Stick-Up: 1.86 NO HINGED LID Y MASP	Construction Details: 10	Permeability Test:
Internal Casing Material: 3" SCA 40 PVC NO CAP Internal Diameter: 3'8" Outside Diameter: 3'8" Total Depth: 41.05' & PLOBES 1999 By Corresion. Stick-Up: 0.69' Condition: 6000 Protective Casing Material: 7HICK GAUGE STEEL Internal Diameter: 1/3" Outside Diameter: 1/2" Total Depth: 2.14'? SURFACE CASING TOTAL Depth: 2.14'? SURFACE CAP Stick-Up: 1.76 NO CAP O.90 S.U. Locked: NO HINGED LID Y MASP	Water Level Data: 25.0 13:	Water Quality Data:
Material: 3" SCA 40 PVC NO CAP Internal Diameter: 3%" Outside Diameter: 3%" Total Depth: 41.05 & PLOBE 199 By CONTY, Stick-Up: 0.69 Condition: GOOD Protective Casing Material: THICK GAUSE STEEL Internal Diameter: 1134" SURFILE CASING TOTAL Depth: 2.14'? SURFILE CASING TOTAL Depth: 2.14'? SURFILE CAP Stick-Up: 1.86 NO HINGED LID Y MASP	Condition of Surface	
Internal Diameter: 3%" Outside Diameter: 3%" Total Depth: 41.05 & PLOSE 1999 By Corresul. Stick-Up: 0.69 Condition: GOOD Protective Casing Material: THICK GOUSE STEEL Internal Diameter: 1134" SURFILE CASING WAS 400 PVC CASING STEEL		
Stick-Up: O.C9 Condition: GOOD Protective Casing Material: THICK GRUSE STEEL Internal Diameter: 1/34" SURFICE CASING Outside Diameter: 1/2" SURFICE CASING Outside Diameter: 1/2" C" XKK 40 PVC C44" O.O. Total Depth: 2.14'? SW' I.O. Stick-Up: 1.86 NO HINGED LID M MASP	Material: 3 5CK 40	PVC NO CAP
Stick-Up: O.G9 Condition: GOOD Protective Casing Material: THICK GRUSE STEEL Internal Diameter: 1/34" SURFICE CASING Outside Diameter: 1/2" SURFICE CASING Outside Diameter: 1/2" C" XKK 40 PVC C4" O.O. Total Depth: 2.14'? SW' I.O. Stick-Up: 1.76 NO CAP O.30 S.U. Locked: NO HINGED LID Y MASP	Internal Diameter: 38"	Cond
Stick-Up: O.G9 Condition: GOOD Protective Casing Material: THICK GRUSE STEEL Internal Diameter: 1134 SURFACE CASING Outside Diameter: 12" SURFACE CASING Outside Diameter: 12" C" XKK 40 PVC C4" O.O. Total Depth: 2.14'? SW" I.O. Stick-Up: 1.76 NO CAP O.30 S.U. Locked: NO HINGED LID M MASP	Outside Diameter:3′a′′	
Stick-Up: O.G9 Condition: GOOD Protective Casing Material: THICK GRUSE STEEL Internal Diameter: 1134 SURFACE CASING Outside Diameter: 12" SURFACE CASING Outside Diameter: 12" C" XKK 40 PVC C4" O.O. Total Depth: 2.14'? SW" I.O. Stick-Up: 1.76 NO CAP O.30 S.U. Locked: NO HINGED LID M MASP	Total Depth: 41.05	PLOBED 199 BY CORPUSCI.
Protective Casing Material: THICK GRUSE STEEL Internal Diameter: 1/34" SURFACE CASING Outside Diameter: 1/2" L" XK 40 PVC Total Depth: 2.14'? STEEL STEEL CASING White Procedure Steel Character Casing And Procedure Surface Character Casing Surface Casing Character Casing Surface Casing Character Casing Locked: NO HINGED LID W MASP	Stick-Up: 0.69	
Protective Casing Material: THICK GRUSE STEEL Internal Diameter: //34" Outside Diameter: /2" Total Depth: 2.14'? Stick-Up: 1.86 Locked: NO HINGED LID Y MASP		
Material: THICK GAUGE STEEL Internal Diameter: 1/3/4" Outside Diameter: 1/2" Total Depth: 2.14'? Stick-Up: 1.86 Locked: NO HINGED LID Y MASP	oondrerom	
Internal Diameter:	Protective Casing	
Internal Diameter:		STEEL
Outside Diameter: 12" Total Depth: 2.14'? Stick-Up: 1.86 Locked: NO HINGED LID Y MASP	2 //	
Total Depth: 2.14'? Stick-Up: 1.86 Locked: NO HINGED LID Y MASP		
Stick-Up: 1.86 Locked: NO HINGED LID Y HASP	12	64 0.0.
Locked: NO HINGED LID Y MASP		•
	Stick-Up: 1,86	· · · · · · · · · · · · · · · · · · ·
Condition: Goon BUT RUSTY	Locked: NO HINGED LI	o y MASP
	Condition: 6000 BUT	RUSTY
	Surface Seal: 2' & COMCR	PAD GOOD

ASSIME RF not suffer & All how from Arapular. 12/28/35 SATOS PART PROFIT L = 199 - 23 = 176 \$ = 31/3"= 313" Louds = (45-138.5)+(153-1855) K= 5,3×10-3 -/8-6 WELL 22-74 Time (minutes) Drawdown (feet) OPump at 0.71 gpm .25 .049 .75 .78 1.88 10 2.74 15 4.21 5.65 7.15 8.59 9.48Cease Pumping 32.5 9.23 - 33.67 9.2 -- 37 9.18 9.13 50 9.06 58 8.98 68 8.89 74 8.84

Lag= 2.7x157-/2.

Br. C.

WELL 22-74



12/11/87

Water Level Data for

Rockwell (Rocky Flats)

Date Measured Depth to Water from TOC

Elevation TOC (ft) Water Level Elev. (ft)

** Well Number: 2274

12/01/87

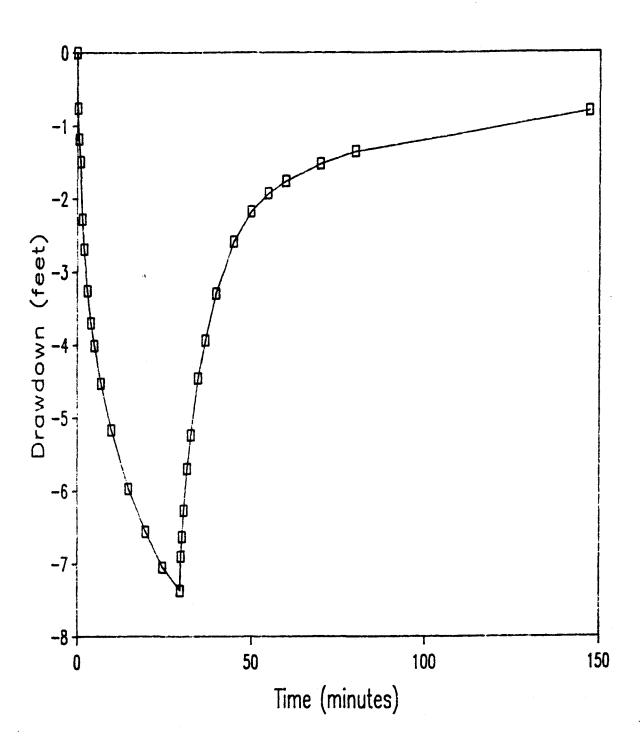
22.50

5957.49

5934.99

Boring	No.: 10-81
Comple	eted as well?yes
Data ir	n File
	Log of Borehole
X	Well Construction Summaries
-	Well Development Summaries
<u> X</u>	Hydraulic Conductivity Test Data
	and Results
	Packer Test Data and Results
X	Water Level Data

	Well Name: <u>W - 10 - 81 (</u>
Elev. of Ground:	Elev. of Top of Casing:
Coordinates:	
Date of Construction:	Constructed By:
	ADILY RIC ORF
Geologic Log: no	Geophysical Log:
Construction Details: NO	Permeability Test: 155
Water Level Data: 15:68' @ 13:	Water Quality Data:
Condition of Surface	
Internal Casing	
Material: SCH. 40	NC
Internal Diameter: 6	
Outside Diameter: $6\frac{98}{}$	
Total Depth: 31.81'	
Stick-Up: 2.11	
Condition: 600	
Protective Casing	
Material:	
Internal Diameter:	
Outside Diameter:	
Total Depth:	
Stick-Up:	
Locked: NO PVC 5	LIP ON CAP
Condition:	
Surface Seal: FARTH	



TIME	DRAWDOWN
(min)	(feet)
12 1	. 00
.25	. 76
. 5	1.18
1	1.49
1.5	2.28
2	2.69
3	3.26
4	3.70
5	4.01
7	4.53
10	5.17
15	5.97
20	6.56
25	7.05
30	7.37
30.25	6.90
30.5	6.63
31	6.27
32	5.70
33	5.24
35	4.46
37	3.94
4Ø	3.30
45	2.59
50	2.18
55	1.93
60	1.76
70	1.52
80	1.35
147	. 81

Pumping ends

r= 125

T=.1 41/-

WELL	۸r	DATE	10-81	1

WATER LEVEL DATA

ELL LOCATIO						POINT		
_EVATION: !	MEASUR	ING POINT			GROUND LEVEL			
WELL or DATE	TIME	MEASURING OEVICE	READING	CONVERSIONS or CORRECTIONS	WATER DEPTH	R LEVEL ELEVATION	BY	COMMENTS
DATE		DEVICE		CORRECTIONS	DEPTH	ELEVATION		
····								
· · · · · · · · · · · · · · · · · · ·								
-13:153	-	Kniffyng	15.5'					Sen Si Vi-
11/21/33	_	KNOTTED ROPE	181					SAMPLING LO
					· · · · · · · · · · · · · · · · · · ·			
3/21/85	13:19	Clympic probe	18.68'				Raw	Well Summer P-Test
2/12/35	10:50	/ ',, '	18.35'				551	P-Test -
·				·				
			· · · · · · -					
		,						
						· · · · · · · · · · · · · · · · · · ·		

ON BORING LOGS

SAMPLE TYPE

Split Spoon

NC Core

Continuous Drive

= Bulk

GRAPHIC LOG

Clay or Shale

Clayey Sand or Sandy Clay

Gravel

Sand or Sandstone

Sand and Gravel

Silt or Siltstone

WATER CONTENT

 ∇

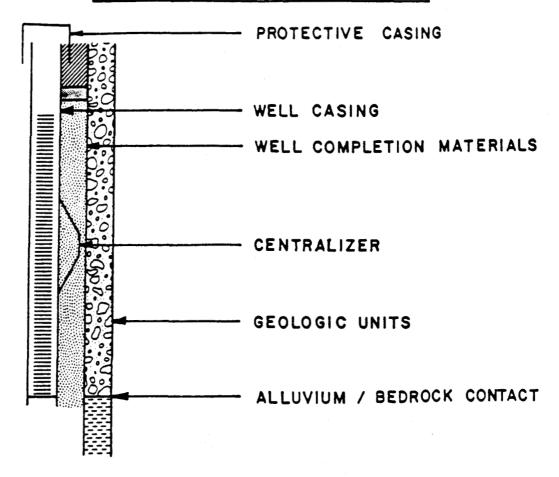
6/6

WATER LEVEL FOUND DURING DRILLING STATIC WATER LEVEL ON 10/13/86

PENETRATION RESISTANCE

STANDARD PENETRATION TEST RESULTS BLOWS PER INCH.

EXPLANATION OF SYMBOLS ON WELL CONSTRUCTION SUMMARIES



WELL CASING

BLANK

SCREEN

WELL COMPLETION MATERIALS

CEMENT GROUT

BENTONITE PELLETS

SAND PACK

CUTTINGS

GEOLOGIC MATERIALS

EXPLANATION PRESENTED IN LOG OF BORING EXPLANATION.

Boring	No.: 33-86
Comple	ted as well? Yes
Data in	File
<u> </u>	Log of Borehole
<u> </u>	Well Construction Summaries
<u> </u>	Well Development Summaries
	Hydraulic Conductivity Test Data
	and Results
<u></u>	Packer Test Data and Results
<u>x</u>	Water Level Data

Project:

Rocky Flats Plant

LOG OF BORING NO.

33-86

Date Drilled 9/10/86

Boring Method Hollow Stem Auger

Coordinates N 36960.9 E 21896.5

Ground Surface Elevation 5949 281

Fiest (feet) Type Log Material Description Rocky Flats Allivium Rocky Flats Allivium							7949.20	
ROCKY FLATS ALLUVIUM Column	Elev. (feet)	Depth (feet)	Semple Type	Graphic Log	Material Description	Resistance (Blows/Inch)	(70)	Other Tests
Recovered 3.1/4.8'= 658. GRAVEL: light olive gray (5Y 5/2) to olive gray (5Y 5/2) to olive gray (5Y 5/2); clayey silt and sand matrix; quartzita pebbles; poorly sorted; subangular; crumbles; dry. 4.8-6.8'-Sample. Recovered 2.0/2.0'=100%. GRAVEL: light olive gray (5Y 5/2); clayey sand matrix; quartzite cobbles and gravel clasts; angular to subangular; moderate sorting; loose; dry. ARAPAHOE FORMATION ARAPAHOE FORMATION 6.8-11.8'-Sample. Recovered 5.0/5.0'=100%. 6.8-7.0': GRAVEL: light olive gray (5Y 5/2); clayey sand matrix; quartzite cobbles and gravel clasts; angular to subangular; moderate sorting; loose; dry. 7.0-11.8': CLAYSTONE: grayish olive gray (5Y 3/2) to grayish yellow green (5GY 7/2) to grayish olive gray (5Y 3/2) to greenish gray (5Y 3/2) to greenish gray (5Y 3/2) and dark yellowish orange (10YR 6/6) stains; well sorted; consolidated; fractured; firm; damp.		0 _		~ ~ <	ROCKY FLATS ALLUVIUM	1111	-	
Recovered 3.1/4.8'= 658. GRAVEL: light olive gray (5Y 5/2) to olive gray (5Y 5/2) to olive gray (5Y 5/2); clayey silt and sand matrix; quartzita pebbles; poorly sorted; subangular; crumbles; dry. 4.8-6.8'-Sample. Recovered 2.0/2.0'=100%. GRAVEL: light olive gray (5Y 5/2); clayey sand matrix; quartzite cobbles and gravel clasts; angular to subangular; moderate sorting; loose; dry. ARAPAHOE FORMATION ARAPAHOE FORMATION 6.8-11.8'-Sample. Recovered 5.0/5.0'=100%. 6.8-7.0': GRAVEL: light olive gray (5Y 5/2); clayey sand matrix; quartzite cobbles and gravel clasts; angular to subangular; moderate sorting; loose; dry. 7.0-11.8': CLAYSTONE: grayish olive gray (5Y 3/2) to grayish yellow green (5GY 7/2) to grayish olive gray (5Y 3/2) to greenish gray (5Y 3/2) to greenish gray (5Y 3/2) and dark yellowish orange (10YR 6/6) stains; well sorted; consolidated; fractured; firm; damp.		1		$\int_{0}^{\infty} 0$			-	
Recovered 3.1/4.8'= 658. GRAVEL: light olive gray (5Y 5/2) to olive gray (5Y 5/2) to olive gray (5Y 5/2); clayey silt and sand matrix; quartzita pebbles; poorly sorted; subangular; crumbles; dry. 4.8-6.8'-Sample. Recovered 2.0/2.0'=100%. GRAVEL: light olive gray (5Y 5/2); clayey sand matrix; quartzite cobbles and gravel clasts; angular to subangular; moderate sorting; loose; dry. ARAPAHOE FORMATION ARAPAHOE FORMATION 6.8-11.8'-Sample. Recovered 5.0/5.0'=100%. 6.8-7.0': GRAVEL: light olive gray (5Y 5/2); clayey sand matrix; quartzite cobbles and gravel clasts; angular to subangular; moderate sorting; loose; dry. 7.0-11.8': CLAYSTONE: grayish olive gray (5Y 3/2) to grayish yellow green (5GY 7/2) to grayish olive gray (5Y 3/2) to greenish gray (5Y 3/2) to greenish gray (5Y 3/2) and dark yellowish orange (10YR 6/6) stains; well sorted; consolidated; fractured; firm; damp.		-		000	·		-	
3/2); clayey silt and sand matrix; quartzite pebbles; poorly sorted; subangular; crumbles; dry. 4.8-6.8'-Sample. Recovered 2.0/2.0'=100\$. GRAVEL: light olive gray (5Y 5/2); clayey sand matrix; quartzite cobbles and gravel clasts; angular to subangular; moderate sorting; loose; dry. ARAPAHOE FORMATION 6.8-11.8'-Sample. Recovered 5.0/5.0'=100\$. 6.8-7.0': GRAVEL: light olive gray (SY 5/2); clayey sand matrix; quartzite cobbles and gravel clasts; angular to subangular; moderate sorting; loose; dry. 7.0-11.8': CLAYSTONE: grayish yellow green (5GY 7/2) to grayish olive gray (5Y 3/2) to greenish gray (5GY 6/1) and dark yellowish orange (10YR 6/6) satins; well sorted; consolidated; fractured; firm; damp.				200	Recovered 3.1/4.8'= 65%. GRAVEL: light olive gray		1 1	·
crumbles; dry. 4.8-6.8'-Sample. Recovered 2.0/2.0'=100\$. GRAVEL: light olive gray (SY 5/2); clayey sand matrix; quartzite cobbles and gravel clasts; angular to subangular; moderate sorting; loose; dry. 6.8-11.8'-Sample. Recovered 5.0/5.0'=100\$. 6.8-7.0': GRAVEL: light olive gray (SY 5/2); clayey sand matrix; quartzite cobbles and gravel clasts; angular to subangular; moderate sorting; loose; dry. 7.0-11.8': CLAYSTONE: grayish yellow green (SGY 7/2) to grayish olive gray (SY 3/2) with olive gray (SY 3/2) to greenish gray (SGY 6/1) and dark yellowish orange (10YR 6/6) stains; well sorted; consolidated; fractured; firm; damp.		5		3000	3/2); clayey silt and sand matrix; quartzite pebbles; poorly sorted; subangular;		-	
4.8-6.8'-Sample. Recovered 2.0/2.0'=100%. GRAVEL: light olive gray (5Y 5/2); clayey sand matrix; quartzite cobbles and gravel clasts; angular to subangular; moderate sorting; loose; dry. ARAPAHOE FORMATION 6.8-11.8'-Sample. Recovered 5.0/5.0'=100%. 6.8-7.0': GRAVEL: light olive gray (5Y 5/2); clayey sand matrix; quartzite cobbles and gravel clasts; angular to subangular; moderate sorting; loose; dry. 7.0-11.8': CLAYSTONE: grayish yellow green (5GY 7/2) to grayish olive gray (5Y 3/2) with olive gray (5Y 3/2) to greenish gray (5GY 6/1) and dark yellowish orange (10YR 6/6) stains; well sorted; consolidated; fractured; firm; damp.		=			crumbles; dry.		=	
(SY 5/2); clayey sand matrix; quartrite cobbles and gravel clasts; angular to subangular; moderate sorting; loose; dry. ARAPAHOE FORMATION 6.8-11.8'-Sample. Recovered 5.0/5.0'=100%. 6.8-7.0': GRAVEL: light olive gray (5Y 5/2); clayey sand matrix; quartzite cobbles and gravel clasts; angular to subangular; moderate sorting; loose; dry. 7.0-11.8': CLAYSTONE: grayish yellow green (50Y 7/2) to grayish olive green (5GY 3/2) with olive gray (5Y 3/2) to greenish gray (5GY 6/1) and dark yellowish orange (10YR 6/6) stains; well sorted; consolidated; fractured; firm; damp.					4.8-6.8'-Sample. Recovered 2.0/2.0'=100%. GRAVEL: light olive gray			
ARAPAHOE FORMATION 6.8-11.8'-Sample. Recovered 5.0/5.0'=100%. 6.8-7.0': GRAVEL: light clive gray (5Y 5/2); clayey sand matrix; quartzite cobbles and gravel clasts; angular to subangular; moderate sorting; loose; dry. 7.0-11.8': CLAYSTONE: grayish yellow green (5GY 7/2) to grayish clive gray (5Y 3/2) with clive gray (5Y 3/2) to greenish gray (5GY 6/1) and dark yellowish orange (10TR 6/6) stains; well sorted; consolidated; fractured; firm; damp.		-			matrix; quartzite cobbles and gravel clasts; angular		-	
6.8-11.8'-Sample. Recovered 5.0/5.0'=100%. 6.8-7.0': GRAVEL: light olive gray (5Y 5/2); clayey sand matrix; quartzite cobbles and gravel clasts; angular to subangular; moderate sorting; loose; dry. 7.0-11.8': CLAYSTONE: grayish yellow green (5GY 7/2) to grayish olive graen (5GY 3/2) with olive gray (5Y 3/2) to greenish gray (5GY 6/1) and dark yellowish orange (10YR 6/6) stains; well sorted; consolidated; fractured; firm; damp.		— 10—						
Recovered 5.0/5.0'=100%. 6.8-7.0': GRAVEL: light olive gray (5Y 5/2); clayey sand matrix; quartzite cobbles and gravel clasts; angular to subangular; moderate sorting; loose; dry. 7.0-11.8': CLAYSTONE: grayish yellow green (5GY 7/2) to grayish olive green (5GY 3/2) with olive gray (5Y 3/2) to greenish gray (5GY 6/1) and dark yellowish orange (10YR 6/6) stains; well sorted; consolidated; fractured; firm; damp.					ARAPAHOE FORMATION		-	
light olive gray (5Y 5/2); clayey sand matrix; quartzite cobbles and gravel clasts; angular to subangular; moderate sorting; loose; dry. 7.0-11.8': CLAYSTONE: grayish yellow green (5GY 7/2) to grayish olive green (5GY 3/2) with olive gray (5Y 3/2) to greenish gray (5Y 6/1) and dark yellowish orange (10YR 6/6) stains; well sorted; consolidated; fractured; firm; damp.		-			Recovered 5.0/5.0'=100%.		=	
gravel clasts; angular to subangular; moderate sorting; loose; dry. 7.0-11.8': CLAYSTONE: grayish yellow green (5GY 7/2) to grayish olive green (5GY 3/2) with olive gray (5Y 3/2) to greenish gray (5GY 6/1) and dark yellowish orange (10YR 6/6) stains; well sorted; consolidated; fractured; firm; damp.		-			light olive gray (5Y 5/2); clayey sand matrix;		=	
grayish yellow green (5GY 7/2) to grayish olive green (5GY 3/2) with olive gray (5Y 3/2) to greenish gray (5GY 6/1) and dark yellowish orange (10YR 6/6) stains; well sorted; consolidated; fractured; firm; damp.		_ 15			gravel clasts; angular to subangular; moderate			
grayish yellow green (5GY 7/2) to grayish olive green (5GY 3/2) with olive gray (5Y 3/2) to greenish gray (5GY 6/1) and dark yellowish orange (10YR 6/6) stains; well sorted; consolidated; fractured; firm; damp.		_					‡	
greenish gray (5GY 6/1) and dark yellowish orange (10YR 6/6) stains; well sorted; consolidated; fractured; firm; damp.		1			grayish yellow green (5GY 7/2) to grayish olive green (5GY 3/2) with			
sorted; consolidated; fractured; firm; damp.		-			greenish gray (5GY 6/1) and dark yellowish orange (10YR 6/6) stains; well		4	
Remarks Logged by: T. Murphy Checked by:		20			sorted; consolidated;			
	Rema	rks	Logg	ged by:	T. Murphy		Checked by:	ME

Project No.

106P06222

Hydro-Search, Inc.

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Project:

Project No.

106P06222

Rocky Flats Plant

LOG OF BORING NO.

33-86

Date Drilled 9/10/86

Boring Method Hollow Stem Auger

Coordinates N 36960.9 E 21896.5

Ground Surface Elevation 5040 201

Boring Meti	nod Hollow	Stem Auger Ground Su	irface Elevat	ion 5949.28'	
Elev. Depth (feet) (feet)	Sample Graphi Type Log	Material Description	Penetration Resistance (Blows/inche 20 40		Other Tests
20					
1111				-	
- 30- 		11.8-16.8'-Sample. Recovered 5.0/5.0'=100%. RQD 5.0/5.0'=100%. CLAYSTONE: grayish yellow green (5GY 7/2) to grayish olive green (5GY 3/2) with olive gray (5Y 3/2) to greenish gray (5GY 6/1) and dark yellowish orange (10YR 6/6) stains; well sorted; consolved.			
35 		fractured; firm; damp. TOTAL DEPTH: 16.8'			
40 Remarks	Logged by:	T. Murphy		Checked by:	

Hydro-Search, Inc.

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WELL	33-86

	Г			V	ELL _	33-	86	
	10	8	WELL CONSTR	RUCTION S	UMM	IARY		
			50/0					
			N 36960.8 E 21896.5		F CASIN		50.70'	
	$\lfloor 2 \rfloor$			T	· · · · · · · · · · · · · · · · · · ·			
		Ď.	DRILLING SUMMARY:	CONSTRUCTION			1	
l		2	TOTAL DEPTH Well: 7.34' Hole: 16.80'	TASK	SI	<u>ART</u> I	FIN	IISH I
			BOREHOLE DIAMETER		1986	TIME	<u>DATE</u> 1986	TIM
			DRILLER Boyles Brothers Drilling Co.	DRILLING: 건대 auger	9/10	1055	_9/10_	_1130
	-4		15865 W. 5th Avenue					
			Golden, CO (Dave Jarvie)					
			RIGMobile B-57	GEOPHYS. LOGGING:		_=_	_=_	_=
8 2			BIT(S)	CASING: 2" stainless	9/10	1310	9/10	1317
den, O Murahy	 6		DRILLING FLUID None	2 Starritus				
Colden, T. Murr								
	}		SURFACE CASING 5" x 4' steel w/ locking	FILTER PLACEMENT		1302	9/10	1305
		至	WELL DESIGN:	CEMENTING:	9/10 9/12	1331 1530	<u>9/10</u> 9/12	1335 1530
NO I	8	弄	BASIS: GEOLOGIC LOG GEOPHYSICAL LOG	CEVELOPMENT: OTHER:	21.15			
LOCATION		芸	CASING STRING(S): C=CASING S=SCREEN	Bentonite	9/10	1305	9/10	1310
בֿ בֿ		薑	<u>0.00' 2.99' Cl </u>		9/10	1250	9/10	1255
	1	至	2.99'- 7.34' SI					
	10	葁						
		蕓		WELL DEVELOR	DAFAIT			
	1	葁		WELL DEVELOP	- MIC 14 1			
		蕓		See Well Devel	onment	Summary	Sheet	
	H ²	五	CASING: CI 2" I.D. Sch. 5 type 316 stain-	500 1022 2000		,		
		蓋	less steel threaded and flush					
Plant		蓋	_iointed					
ts F		. 를	SCREEN: SI 2" I.D. Sch. 5 type 316 stain-			· · · · · · · · · · · · · · · · · · ·		
106P06222 Rocky Flats	1 4		less steel, threaded and flush	COMMENTA				
<u> </u>		量	jointed. 0.010" wire wrap screen.	COMMENTS:				
			O.25' welded bottom cap. CENTRALIZERS Type 304 stainless steel	No water encour	itered o	uring d	cilling.	
	L		4.07' - 5.32'	Top of stainles	s steel	casing	: 1.42	Ť
<u> </u>	H6	<u>=</u>						
PROJECT			FILTER MATERIAL 32-42 silica sand 2.50' - 7.50'	Cave from TD to	16.40'			
8			CEMENT Portland Type I					
	-18		0.00' - 2.00'					
			OTHER 3/8" bentonite bellets			············		
			2.00' - 2.50' 7.50' - 16.40'					
	<u> </u>	20	HYDRO-SEARCH RENO-DENVER	CONSULTING HY	(DROL C	GISTS	GEO! O	GIST
			TITUTE TO THE TOTAL TOTA					J.J.

WELL DEVELOPMENT SUMMARY

DATE	TIME	METHOD	VOLUME	APPEARANCE	COMMENTS
9-12-86	1530	_	_		Dry
		9			
			<u> </u>		
		***			**************************************
`				·	
V.,					

				· · · · · · · · · · · · · · · · · · ·	

Water Level Data for Rockwell (Rocky Flats)

Date Measured	Depth to Water from TOC	Elevation TOC (ft)	Water Level Elev. (ft)
** Well Number	: 3386		
09/12/86	-1.00	5950.70	
10/13/86	-1.00	5950.70	
11/26/86	-1.00	5950.70	
01/01/87	-1.00	5950.70	
02/25/87	-1.00	5950.70	
03/24/87	-1.00	5950.70	
05/08/87	-1.00	5950.70	
06/03/87	-1.00	5950.70	
07/08/87	-1.00	5950.70	
08/04/87	-1.00	5950.70	
09/03/87	-1.00	5950.70	
09/24/87	-1.00	5950.70	
09/24/87	-1.00	5950.70	
10/21/87	-1.00	5950.70	
11/09/87	-1.00	5950.70	
12/01/87	-1.00	5950.70	

INDEX OF DATA

Boring	No.: 34-86	
Comple	ted as well? Yes	
Data in	File	
X	Log of Borehole	
X_	Well Construction Summaries	
X	Well Development Summaries	
X	Hydraulic Conductivity Test Data	
	and Results	
X_	Packer Test Data and Results	
X_	Water Level Data	

Project No.

106P06222

Rocky Flats Plant

LOG OF BORING NO.

34-86

Date Drilled 8/20/86, 8/26/86, 8/28/86

Hollow Stem Auger/NC Core

Coordinates N 37171.4 E 23088.4

Ground Surface Elevation 5910.44

Boring Method Hollow Stem Auger/NC Core Ground Surface Elevation 5910.44'							
Elev. (feet)	Depth Sampla Graphic (feet) Type Log		Graphic Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	- '/ \ \	Other Tests
	0			VALLEY FILL		1111	
				0-1.3'-Sample. Recovered 1.3/1.3'=100%. CLAY:			
	-			grayish olive (10Y 4/2)		-	
	-			to light olive gray (5Y 5/2) silty clay;		-	
	-			some sand, gravel and cobbles; subrounded;			
				poorly sorted; grasses at surface; dry.			
]					7	·
	_ 5_			2.0-4.0'-Sample. Recovered 1.9/2.0'=95%. SILTY CLAY:		4	
	-			moderate to dark yellowish			
	-			brown (10YR 6/2); white feldspar grains along with	[-	
	1			quartzite and granite particles; poorly sorted;			
				subangular; few roots; dry.]	
				4.0-7.0'-Sample. Recovered		_	
	_			0.0/3.0'=0%. Recovered		-	
	-			7 0-12 01-0		-	
				7.0-12.0'-Sample. Recovered 2.5/5.0'=50%.		-	
 	— 10 —			CLAYSTONE: olive gray (5Y 4/1); trace silt and		-	
				sand; gravel lense at 8.6'; grades downward into light		L	
				olive gray (5Y 5/2) clay;			
	 			large subrounded cobble at bottom; soft; sticky; damp		4	
	4		0000	to moist.		-4	
	一十		000	10.0.15.01.0		4	
	4		OS:	12.0-17.0'-Sample. Recovered 2.7/5.0'=54%.		–	
	7	1	JOO	,]	
	_ 15_	/)	00	12.0-16.1'. GRAVEL: light		1	
	4		10°0	olive gray (5Y 5/2) with abundant pink granite and		4	
	4	´ ,	200	quartzite; poorly sorted; angular to subangular; some		4	
•				sand; trace clay; wet.		4	
	Ţ			ARAPAHOE FORMATION]	
	4	/ /		16.1-17.0'. CLAYSTONE:		4	
	4			dusky yellow (5Y 7/6); abundant medium light gray		4	
	4			(N 6) horizontal mottles;			
	20			well sorted; consolidated; firm; damp.			
Rema	rks	Logge	ed by: 1	C. Murphy & L. Pivonka		Checked by:	765
0	- 4 11 -						

Hydro-Search, Inc.

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Project No.

106P06222

Rocky Flats Plant

LOG OF BORING NO.

34-86

Date Drilled 8/20/86, 8/26/86, 8/28/86

Coordinates N 37171.4 E 23088.4 Ground Surface Elevation 5910.44'

Boring Method Hollow Stem Auger/NC Core Ground Surface Elevation 5910.44'							
Elev. (feet)	Depth (feet)	Semple Type	Graphic Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	Content 20 40	Other Tests
	20						
				17.0-22.8'-Sample.			
	_	r		Recovered 4.8/4.8'=100%.		7	
	_			CLAYSTONE: light olive gray (5Y 5/2) clay with		_	
	_			some silt; dark yellowish		-	
				orange (10YR 6/6) mottles;		-	
				well sorted; firm; damp.			
				22.8-27.8'-Sample.			
		r		Recovered 5.0/5.0'=100%.		٦	
	-			CLAYSTONE: light olive gray (5Y 5/2); some silt;		4	
	— 25 —	Υ,		some dark yellowish orange		_	
				(10YR 6/6) mottles; well		_	
				sorted; firm; damp.			
				27.8-32.8'-Sample.			
	-			Recovered 5.0/5.0'=100%.			
	-			CLAYSTONE: light olive gray (5Y 5/2) and medium		7	
		$V \downarrow$		gray (N 5); limonite stains		-	
		. /		dark yellowish orange		-	
				(10YR 6/6) abundant; black			
				wood fragments common; trace silt and sand; iron			
	-			stain along fractures; well			
	— 30 —			sorted; firm; damp.			
	-					-	
	_	Y A				-	
				32.8-37.8'-Sample.	i i	-	
				Recovered 5.0/5.0'=100%.			
				CLAYSTONE: olive gray (5Y 3/2) with minor dark	i	لے	
				yellowish orange (10YR 6/6)	· 1		
				limonite stains; black wood	Į į		
	_			fragments common; trace	1	4	
		r		silt and sand; well sorted; firm; damp.		4	
	_			IIIm, damp.		-	
	— 35 —] 1	4	
	55]	_	
			=====		l I	·	
					1		
	-			38.0-43.8'-Sample.		7	
		ľ		Recovered 5.8/5.8'=100%.			
	_			CLAYSTONE: dark gray (N 3); silty with trace of	1 1		
		\vdash \vdash \vdash \vdash		FeO stringers; some] 1	4	
				charcoal wood fragments;		-4	
				well sorted; consolidated;			
				damp.	<u> </u>		
	40					. 1 1 1 1 1 1 1	
Rema				m		Charles have	I
nema	11.75	Logg	ged by:	T. Murphy & L. Pivonka		Checked by:	2
D1-			.		2		

Hydro-Search, Inc.

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Rocky Flats Plant

LOG OF BORING NO.

34-86

Date Drilled 8/20/86, 8/26/86, 8/28/86

Coordinates N 37171.4

E 23088.4

Boring Method

Hollow Stem Auger/NC Core

Ground Surface Elevation

Bori	ng Met	noa	Hollow	Stem Auger/NC Core Ground St	irtace Elevati	3,2.0	
Elev. (feet)	Depth (feet)	Sempla Type	Graphic Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	l Colifent	Other Tests
1981.	40 - 45 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -			43.8-45.0'-Sample. Recovered 1.2/1.2'=100%. SANDSTONE: dark gray (N 3); clay-rich; greenish gray (5GY 6/1) clay; well sorted; consolidated; damp. 45.0-48.0'-Sample. Recovered 3.0/3.0'=100%. SANDSTONE: medium gray (N 5) laminated sandstone 0.5" thick with dark gray (N 3) claystone interbeds 0.1" thick; some of the thicker laminae contain coal material; very light gray (N 8) sandy clasts within the lower 1.5'; well sorted; consolidated; damp. 48.0-52.3'-Sample. Recovered 0.2/4.3'=5%. SANDSTONE: medium light gray (N 6); silty; laminated; well sorted; consolidated; damp. 52.3-53.4'-Sample. Recovered 1.1/1.1'=100%. SANDSTONE: medium light gray (N 6); silty; laminated; well sorted; consolidated; damp. 53.4-54.4'-Sample. Recovered 1.0/1.0'=100%. SANDSTONE: medium gray (N 5); laminated; well cemented with calcium carbonate; consolidated; damp.			
	7					7	
	60_					-	
Remar	rks	Logge	ad by• 1	Murnby & I. Piwonka		Checked byta	

Remarks

Logged by: T. Murphy & L. Pivonka

Checked by

Project No.

106P06222

Hydro-Search, Inc.

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Rocky Flats Plant

LOG OF BORING NO.

Date Drilled 8/20/86, 8/26/86, 8/28/86 Boring Method Hollow Stem Auger/NC Core

Coordinates N 37171.4 E 23088.4 Ground Surface Elevation 5910.44'

Bori	ng Meti	hod Hollow	Stem Auger/NC Core Ground Su	rface Elevati	on 5910.44'				
Elev. (feet)	Depth (feet)	Sample Graphi Type Log	Material Description	Penetration Resistance (Blows/Inch) 20 40		Other Tests			
	60		S4.4-55.6'-Sample. Recovered 1.2/1.2'=100%. SANDSTONE: medium gray (N 5); laminated; well cemented with calcium carbonate; consolidated; damp. 55.6-59.3'-Sample. Recovered 3.7/3.7'=100%. CLAYSTONE: dark gray (N 3); variable quantities of silt and sand; abundant clay; consolidated; well sorted; firm; moist. 59.3-62.5'-Sample. Recovered 3.2/3.2'=100%. CLAYSTONE: dark gray (N 3); silty; light gray (N 7) mottling; firm; consolidated; well sorted; moist. 62.5-64.5'-Sample. Recovered 2.0/2.0'=100%. SANDSTONE: light gray (N 7) clay laminated sandstone; gradational contact; well sorted; consolidated; moist. 64.5-69.3'-Sample. Recovered 4.8/4.8'=100%. SANDSTONE: light gray (N 7) and medium light gray (N 6) silty sandstone with trace of wood fossils; sand content increases with depth; consolidated; well sorted; firm; dry. 69.3-71.0'-Sample. Recovered 1.7/1.7'=100%. CLAYSTONE: medium gray (N 5) silty and fine- grained sandy claystone; well sorted; firm; damp.						
Remai	rks	Remarks Logged by: T. Murphy & L. Pivonka Checked by:							

Project No.

106P06222

Hydro-Search, Inc.

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Rocky Flats Plant

LOG OF BORING NO.

Coordinates N 37171.4 E 23088.4 **Date Drilled** 8/20/86, 8/26/86, 8/28/86 Boring Method Hollow Stem Auger/NC Core Ground Surface Elevation 5910.44'

Bori	Boring Method Hollow Stem Auger/NC Core Ground Surface Elevation 3919.44							
Elev. (feet)	Depth (feet)	Semple Type	Graphic Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	Content 20 40	Other Tests	
	80			71.0-74.3'-Sample.	1111		1	
	1 7	Y }		Recovered 3.3/3.3'=100%.	1	7	Į į	
	1 -1	¶ 1		CLAYSTONE: dark gray	1 1	1	7	
	1 -1	1 1		(N 3); blocky texture; well sorted; firm; damp.	4 7	1 →	1 !	
	1 -1	¶ }		well softed; Illm; damp.	ţ <u>1</u>	! →	,	
1 1	1 7	1 1			4 7	1 -	ŋ l	
	1 7	1 1		74.3-75.3'-Sample.	4 y		Ţ I	
	1 7	1 1		Recovered 0.6/1.0'=60%. CLAYSTONE: dark gray	ų l	7	Ţ !	
	1 -1	1 1		(N 3); grayish orange	ş i	1 7	Ţ	
	1 →	 		(10YR 7/4) mottles; well	7	1 -	Į l	
	1 4	1 1		sorted; consolidated; damp.	1 1	1 -	Į į	
	 85 				4 1	1	Ţ l	
	~			75.3-78.5'-Sample.	1 1		Ţ	
,	1 7			Recovered 3.2/3.2'=100%. SANDSTONE: medium gray	1 1		Į į	
1 1	1 -1			(N 5) silty sandstone; well	1 1		Ţ l	
1 1	1 -1			sorted; consolidated; damp.	1 1	,	Ţ	
į į	1 1	1 1			, ,	-	η Ι	
1 1	1 1	1 1 h		78.5-83.5'-Sample.	1 I		1 1	
1. I	1 7	1 1		78.5-83.5'-Sample. Recovered 5.0/5.0'=100%.	, ,		Į į	
1 1	1 -1	1		CLAYSTONE: medium dark	,		, l	
1 1	1 -1			grav (N 4); blocky texture;	, j		1 · 1	
1 1	1 -1	1		well sorted; consolidated;	, I	-	, <u>,</u>	
ı i	L	1 1		damp.	1 1	-	Ţ j	
1 1	—90 —	! 		1	1 1		ļ. 1	
1 I	20	\		83.5-86.0'-Sample.	į l		1	
1 I	1 1	1 1		Recoverd 2.5/2.5'=100%.	Y		Ţ "	
1 1	1 -	1 1		CLAYSTONE: medium dark	,	, 1	ļ 1	
, I	1 -	\		gray (N 4); blocky texture; trace of pale yellowish	1 1		Ţ . .	
1	1 -	1 		orange (10YR 8/6) nodules;	1 1	-	1	
ı I	נ י	\		well sorted; consolidated;	, j		ļ · · · •	
1 1	1	1 		damp.	į į		1	
; I		1 1		l	1 1		1	
1 1	· 1	1 1		86.0-86.6'-Sample.	, I	٦	ļ · •	
, 1	-	' 		Recovered 0.6/0.6'=100%.	y J	7	1	
	1	\		CLAYSTONE: medium dark gray (N 4); blocky texture;	, 1	-	Į į	
L	95	1		trace of pale yellowish	7 1	_	1	
j 1		1		orange (10YR 8/6) nodules;	ł I		1 1	
. 1	7	\		well sorted; consolidated;	Į Į		•	
ı	· 1			damp.	1	7	1	
	-	' 		06 6-00 01 0	,	٦	1	
I		' 		86.6-89.0'-Sample. Recovered 2.4/2.4'=100%.	Į į	4		
i	' 1			CLAYSTONE: greenish gray	,	· -		
ı		1 1		(5GY 6/1) silty sandstone	, 1	4		
ı	7			with clay laminae; well	1	لـ	1	
I	1			sorted; consolidated; damp.	Ţ 1		ļ ·	
ı	–	' 		<u> </u>	, 1	7	1 1	
I	100	۱ ۱		·	1,,,,1		<u>.</u>	
		للسنب				~	(IP)	
Rema	rks	Logg	ed by: 1	T. Murphy & L. Pivonka		Checked by:	7.1 77	

Project No.

106P06222

Hydro-Search, Inc.

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Rocky Flats Plant

LOG OF BORING NO.

Date Drilled
Boring Method

Coordinates

Ground Surface Elevation

Boring Method			ب	Ground Surface Elevation ,				
Elev. (feet)	Depth (feet)	Semple Type	Graphic Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	Content 20 40	Other Tests	
	100				1111			
	_			96.0-100.0'-Sample.		-		
	-			Recovered 4.0/4.0'=100%. CLAYSTONE: medium dark ~		-		
	-	l l		gray (N 4); gradational contact; some very fine-		-		
	_			<pre>grained sand; well sorted; consolidated; damp.</pre>		l J		
				TOTAL DEPTH: 100.0'	,		i	
	_		4	TOTAL DEPTH: 100.0		_		
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Remar	rks	Logge	d by:			Checked by:	UP	
Proje	ct No.			Hydro-Search I	20			
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106P06222

Hydro-Search, Inc.

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	34-86		
WELL	J4~00		

WELL CONSTRUCTION SUMMARY 5910.44' ELEVATION: GROUND LEVEL --LOCATION or COORDS: -TOP OF CASING 5912.78' E 23088.4 N 37171.4 CONSTRUCTION TIME LOG: DRILLING SUMMARY: FINISH START TOTAL DEPTH Well: 56.25' Hole: 100.00' TASK BOREHOLE DIAMETER 0.00' - 37.80': 7성" TIME TIME 37.80' - 100.00': 4 3/4" DRILLING: 8/20 1251 8/20 1545 7년" auger Boyles Brothers Drilling Co. DRILLER ___ 1202 8/26 1503 9/2 4 3/4" core 15865 W. 5th Avenue, Golden Pivonka (David Jarvie, Jim Horn) GEOPHYS. LOGGING: Mobile B-57 RIG __ BIT(S) 0.00' - 37.80': Blade bit CASING: 8/21 0800 8/21 1335 T. Murphy/L. 5" steel 37.80' - 100.00': Bull nose rock bit 0845 9/3 0900 2" stainless 9/3 DRILLING FLUID _____None SURFACE CASING 5" x 40.8' steel w/ locking 9/3 9/3 0900 1145 FILTER PLACEMENT 9/2 1604 1716 9/2 CEMENTING: ERSONNEL 9/12 1000 1015 WELL DESIGN: 9/5 CEVELCPMENT: BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG OTHER: Tementing 5" casing 8/21 1456 8/21 1359 CASING STRING(S): C=CASING S=SCREEN 1210 1150 9/3 9/3 ower cement 0.00' 37.80' C1 9/3 0823 9/3 0845 0.00'- 44.24' C2 Bentonite 9/3 1145 9/3 1150 44.24'- 56.25' SI 50 1725 1056 acker test WELL DEVELOPMENT See Well Development Summary Sheet 60 5" I.D. steel CASING: CI_ c2 2" I.D., Sch. 5 type 316 stainless steel, threaded and flush Plant iointed. 2" I.D., Sch. 5 type 316 stain-Rocky Flats less steel, threaded and flush COMMENTS: jointed, 0.010" wire wrap screen Water encountered at 48.0' during drilling. 0.25' welded bottom cap. CENTRALIZERS Type 304 stainless steel Top of stainless steel casing: 22.47' - 23.70' 80 49.01' - 50.26' Cave from T.D. to 90.0' FILTER MATERIAL 32-42 silica sand 43.00' - 56.50' CEMENT Portland Type I 0.00' - 42.00'; 90.00' - 64.50' 90 OTHER 3/8" bentonite pellets 42.00' - 43.00' 56.50' - 64.50' CONSULTING HYDROLOGISTS-GEOLOGIST HYDRO-SEARCH RENO-DENVER

COCATION

106P06222

PROJECT

WELL DEVELOPMENT SUMMARY

DATE	TIME	METHOD	VOLUME	APPEARANCE	COMMENTS
9-5-86	1000				Well Bore Volume = 5.9 gals. 10 Well Bore Volumes = 59 gals.
9-5-86	1000	Pumped ·	4.5 gals.	Muddy, clayey well bottom	4.5/59 gals. purged to date
9-8-86	1635	Airlifted	5.2 gals.	Initially clear, then light brown on bottom	Airlifted for 0.75 hours
9-9-86	1430	Bailed	6.5 gals.	Initially clear, then moderately turbid	Bailed some silts and fine sands 11/59 gals. purged to date
9–10-86	1256	Bailed	19 gals.	Clear, very little turbidity	Bailed 2.5 hours, clear 30/59 gals. purged to date
9-11-86	1220	Bailed	29 gals.	Clear	Ready to Sample 59/59 gals. purged to date
9-12-86	1015	Bailed		Clear	Sampled
-					
			·		

AQUIFER TEST DATA

WELL 34-86

Type of Aquifer Test:

Bail down - Recovery

How Q Measured: 4.5 gallon bucket How W.L.'s Measured:

Olympic Well Sounder

Measuring Point for W.L.'s:

Top of Casing

Time:

Time:

Location: Rocky Flats Plant Personnel: W. Herst, D. Pavlick

Project No.: 106P06222

Elevation of Measuring Point:

5914.7

Depth of pump/airline:

Start bailing: Stop bailing:

9/29/86 9/29/86

0918:00 0940:00

Water

Level

Duration of Aquifer Test:

162 minutes

TIME

WATER LEVEL DATA Static Water Level: 20.80' COMMENTS

t = 22

t

29.0

30.0

31.0

32.0

33.0

34.0

35.0

36.0

37.0

38.0

40.5

42.0

44.0

46.3

48.0

50.0

52.0

54.0

at t' = 0

ť'

Draw-

down

29.55

28.93

28.31

27.78

27.40

26.97

26.60

26.26

25.95

25.61

24.89

24.49

23.88

23.22

22.57

21.84

21.23

20.50

50.35

49.73

49.11

48.58

48.20

47.77

47.40

47.06

46.75

46.41

45.69

45.29

44.68

44.02

43.37

42.64

42.03

41.30

Begin bailing Bailed 2 gallons Bailed 2 gallons Bailed 2 gallons Bailed 2 gallons Bailed 1 gallon,

stopped bailing

0		20.80	
3.3			
7.3			
12.1			
18.6			
22.0	0		
23.5	1.5	54.39	33.59
24.1	2.1	53.91	33.11
24.6	2.6	52.64	31.84
25.0	3.0	53.11	32.31
25.5	3.5	52. <i>77</i>	31.97
26.0	4.0	52.44	31.64
26.5	4.5	52.06	31.26
27.2	5.2	51.59	30.79
27.5	5.5	51.37	30.57
28.0	6.0	50.97	30.17

7.0

8.0

9.0

10.0

11.0

12.0

13.0

14.0

15.0

16.0

18.5

20.0

22.0

24.3

26.0

28.0

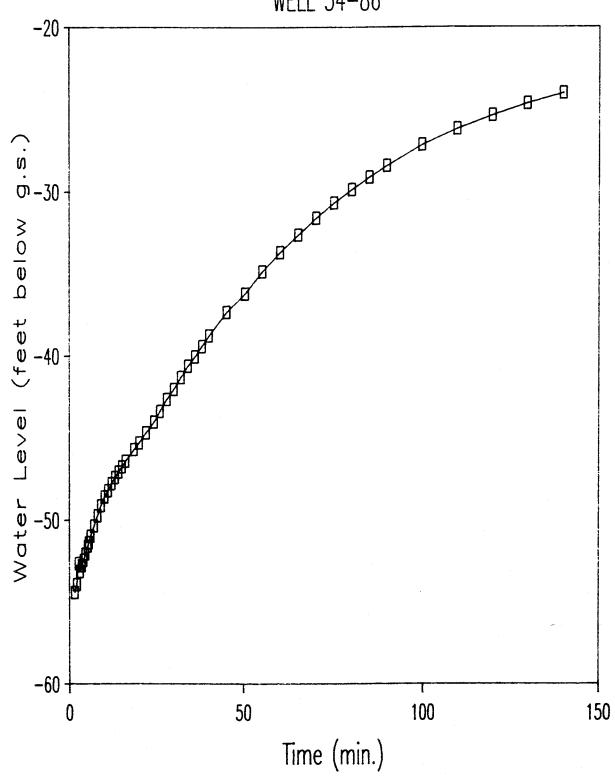
30.0

32.0

56.0	34.0	40.62	19.82
58.0	36.0	40.05	19.25
60.0	38.0	39.42	18.62
62.0	40.0	38.77	17.97
67.0	45.0	37.33	16.53
72.2	50.2	36.21	15.41
77.0	55.0	34.85	14.05
82.0	60.0	33.68	12.88
87.0	65.0	32.62	11.82
92.0	70.0	31.60	10.80
97.0	75.0	30.68	9.88
102.0	80.0	29.87	9.07
107.0	85.0	29.12	8.32
112.0	90.0	28.42	7.62
122.0	100.0	27.15	6.35
132.0	110.0	26.18	5.38
142.0	120.0	25.36	4.56
152.0	130.0	24.64	3.84
162.0	140.0	24.02	3.22

90% recovered at 24.15'

AQUIFER TEST DATA WELL 34-86



PROGRAM SLUGT, VERSION 4,0C1. 1985

THIS PROGRAM CALCULATES MEAN TRANSMISSIVITIES FROM SLUG-TEST DATA BASED ON TWO ANALYTICAL APPROACHES:

- (1) NETHOD OF COOPER, BREDEHOEFT AND PAPADOPULOS, 1967 (ARTICLE IN VOL.3,NO.1 OF MRR ENTITLED "RESPONSE OF A FINITE DIAMETER WELL TO AN INSTANTAMEDUS CHARGE OF MATER")
- (2) NETHOD OF BOUNER AND RICE, 1976 (ARTICLE IN VOL. 12, NO.3 OF WAR ENTITLED "A SLUG TEST FOR DETERMINING HYDRAULIC CONDUCTIVITY OF UNCONFINED AQUIFERS WITH COMPLETELY OR PARTIALLY PENETRATING WELLS")

PROJECT NO.: 6-0118-87

CLIENT: Rockwell International

ITE LOCATION: Rocky Flats Plant

DATE OF SLUG TEST: 10-14-87

FIELD INVESTIGATOR: Kevin McNeill

WELL NO .: 34-86

IMPUT DATA ARE:

INMER CASING DIAMETER = 2.00 INCHES

INMER SCREEN OR OPEN-HOLE DIAMETER = 2.00 INCHES

DIAMETER OF DRILLED HOLE = 4.75 INCHES

ESTIMATED POROSITY OF GRAVEL PACK = .25

NUMBER OF HEAD-TIME DATA POINTS = 36

LENGTH OF SCREEN OR INTAKE PORTION = 13.50 FEET

DEPTH FROM STATIC LEVEL TO BOTTOM OF SCREEN = 35.48 FEET

THICKNESS OF SATURATED AGUIFER ZONE = 10.60 FEET

FALLING-HEAD INDEX = 0 ("1" IF FALLING."0" IF RISING)

1.00 1.250 2.00 1.240 3.00 1.240 4.00 1.240 5.00 1.240 6.00 1.240 7.00 1.230 8.00 1.230 9.00 1.230 10.00 1.230 15.00 1.220 20.00 1.210 50.00 1.170 110.00 1.150 140.00 1.150 140.00 1.150 140.00 1.100 230.00 1.070 290.00 1.090 240.00 1.090 240.00 1.090 250.00 1.090 250.00 1.090 260.00 1.090 260.00 1.090 260.00 1.090 260.00 1.090 260.00 1.090 260.00 1.090 260.00 1.090 260.00 1.090 260.00 1.090 270.00 1.000 270.00 1.000 270.00 1.000 270.00 1.000 270.00 1.000 270.00 1.000 270.00 1.000 270.00 1.000 270.00 1.000	TIME (sec)	HEAD (FEET)
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980.00 .830 1100.00 .800 1220.00 .770 1470.00 .720		
1100.00 .800 1220.00 .770 1470.00 .720		
1220.00 .770 1470.00 .720		
1470.00 .720		

2180.00 .600 2540.00 .550

HO WAS COMPUTED FROM INTERCEPT OF PLOT OF LOG(H) VS. TIME

SUCCESSIVE COMPUTED VALUES FOR HO (FEET)

1.1992

METHOD OF COOPER, BREDEHOEFT AND PAPADOPULOS

COMPUTED RESULTS:

COMPUTED VALUE OF HO = 1.26 FEET

	NOTE:	TRANSMISSIVITY	Y UNITS ARE IN	FT##2/sec	AND PERMEABIL	LITY UNITS ARE II	N FT/sec	
ALPHA	STORATIVITY	MEAN TRANSMIS- SIVITY	MEAN PERMEA- BILITY	MINIHUM TRANS.	HAXIMUM TRANS.	RATIO OF "T" RANGE TO TBAR	ROOT MEAN SQUARE OF TIME DEVIATIONS	DIFFERENCE IN RMS
1.000E-91	1.000E-01	1.219E-06	1.150E-07	8.062E-07	2.973E-06	1.777096	165.06	.00
1.000E-02	1.000E-02	4.525E-06	4.269E-07	2.982E-06	1.407E-05	2.449227	265.58	-100.53
1.000E-03	1.000E-03	1.139E-05	1.074E-06	4.444E-06	4.553E-05	3.607872	471.85	-206.27
1.000E-04	1.000E-04	1.970E-05	1.858E-06	5.893E-06	8.584E-05	4.058690	544.15	-72.29
1.000E-05	1.000E-05	2.804E-05	2.646E-06	7.311E-06	1.284E-04	4.317917	574.94	-30.79
1.0008-05	1.000E-06	3.622E-05	3.417E-06	8.713E-06	1.7288-04	4.530688	591.00	-16.07
1.000E-07	1.000E-07	4.424E-05	4.173E-06	1.010E-05	2.162E-04	4.659535	600.79	-9.78
1.000E-08	1.000E-08	5.214E-05	4.919E-06	1.148E-05	2.589E-04	4.744845	607.35	-6.56
1.000E-09	1.000E-09	6.000E-05	5.660E-06	1.284E-05	3.016E-04	4.812938	612.13	-4.79
1.000E-10	1.000E-10	6.778E-05	6.394E-06	1.421E-05	3.427E-04	4.847080	615.68	-3.55

METHOD OF BOUNER AND RICE

COMPUTED RESULTS USING DIAMETER OF DRILLED HOLE:

PERMEABILITY = 3.50E-07 FT/sec

= 1.07E-05 CM/sec

TRANSHISSIVITY = 3.71E-06 FT++2/sec

COMPUTED RESULTS USING DIAMETER OF CASING AND SCREEN:

PERMEABILITY = 4.18E-07 FT/sec

= 1.27E-05 CH/sec

TRANSMISSIVITY = 4.43E-06 FT = 2/sec

WELL NO .: 34-86

INPUT DATA ARE:

INNER CASING DIAMETER = 2.00 INCHES LENGTH
INNER SCREEN OR OPEN-HOLE DIAMETER = 2.00 INCHES DEPTH
DIAMETER OF DRILLED HOLE = 4.75 INCHES THICKN
ESTIMATED POROSITY OF GRAVEL PACK = .25 FALLIN
NUMBER OF HEAD-TIME DATA POINTS = 36

LENGTH OF SCREEN OR INTAKE PORTION = 13.50 FEET

DEPTH FROM STATIC LEVEL TO BOTTOM OF SCREEN = 35.48 FEET

THICKNESS OF SATURATED ADUIFER ZONE = 10.60 FEET

FALLING-HEAD INDEX = 0 ("1" IF FALLING."0" IF RISING)

TIME	HEAD
(SEC)	(FEET)
1.00	1.250
2.00	1.240
3.00	1.240
4.00	1.240
5.00	1.240
6.00	1.240
7.00	1.230
8.00	1.230
9.00	1.230
10.00	1.230
15.00	1.220
20.00	1.210
50.00	1.190
80.00	1.170
110.00	1.150
140.00	1.130
170.00	1.110
200.00	1.100
230.00	1.090
260.00	1.070
290.00	1.060
320.00	1.050
380.00	1.020
440.00	1.000
500.00	.780
560.00	. 960
620.00	.940
740.00	.900
860.00	.860
980.00	.830

1100.00	.800
1220.00	.770
1470.00	.720
1820.00	. 650
2180.00	.600
2540.00	.550

HO WAS COMPUTED FROM KNOWN VOLUME OF SLUG

VOLUME OF SLUG ENTERED = .03270 CUBIC FEET

METHOD OF COOPER, BREDEHOEFT AND PAPADOPULOS

COMPUTED RESULTS:

COMPUTED VALUE OF HO = 1.50 FEET

	NOTE:	TRANSMISSIVITY	UNITS ARE IN	FT##2/sec	AND PERMEABIL	LITY UNITS ARE IN	l FT/sec	
ALPHA	STORATIVITY	MEAN TRANSHIS- SIVITY	MEAN PERMEA- BILITY	MINIMUM TRANS.	MAXIMUM TRANS.	RATIO OF *T* RANGE TO TBAR	ROOT MEAN SQUARE OF TIME DEVIATIONS	DIFFERENCE IN RMS
1.000E-01	1.000E-01	2.996E-05	2.826E-06	2.116E-06	3.056E-04	10.129200	745.51	.00
1.000E-02	1.000E-02	9.116E-05	8.600E-06	3.831E-06	9.570E-04	10.455520	766.23	-20.73
1.000E-03	1.000E-03	1.667E-04	1.573E-05	5.632E-06	1.772E-03	10.594520	772.84	-6.60
1.000E-04	1.000E-04	2.427E-04	2.290E-05	7.354E-06	2.593E-03	10.654160	775.54	-2.70
1.000E-05	1.000E-05	3.169E-04	2.990E-05	9.060E-06	3.395E-03	10.485580	776.88	-1.33
1.000E-03	1.000E-06	3.897E-04	3.677E-05	1.075E-05	4.183E-03	10.704240	777.68	80
1.000E-07	1.000E-07	4.616E-04	4.355E-05	1.241E-05	4.959E-03	10.716130	778.21	53
1.000E-03	1.000E-08	5.328E-04	5.026E-05	1.407E-05	5.728E-03	10.724790	778.59	38
1.000E-09	1.000E-09	6.035E-04	5.693E-05	1.572E-05	6.492E-03	10.731120	778.87	28
1.000E-10	1.000E-10	6.737E-04	6.356E-05	1.736E-05	7.251E-03	10.736540	779.09	22

PACKER TEST ANALYSIS WELL NO. 34-86

ROCKY FLATS PLANT JOB NO. 106F06222

DATE TESTED: 8/29/86 BY: L. PIVONKA

TEST INTERVAL (FEET BELOW G.S.): 46.01 - 56.00

MATERIAL TESTED: ARAPAHOE SANDSTONE

DEPTH TO WATER (FEET BELOW G.S.): 20.46

Q L K = ----- LN(--)

2(PI)(L)(H) R

1ST P1/3 TEST

Q = INJECTION RATE = .00165170 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.99 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

 \approx 20.46 + 3.30 + 3.50 * 2.31 = 31.84

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000341 FT/MIN

K = .00000173 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .000000000 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.99 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 20.46 + 3.30 + 10.00 * 2.31 = 46.86

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .000000000 FT/MIN

K = .000000000 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00601109 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.99 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 20.46 + 3.30 + 3.50 * 2.31 = 31.84

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00001240 FT/MIN

K = .00000630 CM/SEC

PACKER TEST ANALYSIS WELL NO. 34-86

ROCKY FLATS PLANT JOB NO. 106P06222

DATE TESTED: 8/29/86 BY: L. PIVONKA

TEST INTERVAL (FEET BELOW G.S.): 55.01 - 65.00

MATERIAL TESTED: ARAFAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 20.46

 $K = \frac{Q}{2(PI)(L)(H)}$ E

1ST P1/3 TEST

Q = INJECTION RATE = .00380432 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.99 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 20.46 + 3.30 + 3.00 * 2.31 = 30.69

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000815 FT/MIN

K = .00000414 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00902772 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.99 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 20.46 + 3.30 + 12.50 * 2.31 = 52.63

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00001127 FT/MIN

K = .00000573 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00143508 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.99 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEFTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 20.46 + 3.30 + 3.00 * 2.31 = 30.69

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .000000307 FT/MIN

K = .00000156 CM/SEC

PACKER TEST ANALYSIS WELL NO. 34-86

ROCKY FLATS FLANT JOB NO. 106P06222

DATE TESTED: 8/29/86 BY: L. PIVONKA

TEST INTERVAL (FEET BELOW G.S.): 76.71 - 86.70

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 20.46

1ST F1/3 TEST

Q = INJECTION RATE = .00077169 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.99 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 20.46 + 3.30 + 13.50 * 2.31 = 54.94

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000092 FT/MIN

K = .00000047 CM/SEC

P2/3 TEST

 Ω = INJECTION RATE = .00000000 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.99 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 20.46 + 3.30 + .00 * 2.31 = 23.76

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .000000000 FT/MIN

K ≈ .00000000 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00000000 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.99 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 20.46 + 3.30 + .00 * 2.31 = 23.76

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000000 FT/MIN
K = .00000000 CM/SEC

PAC-ER TEST ANALYSIS

WELL NO. 34-86

ROCKY FLATS PLANT JOB NO. 106P06222

DATE TESTED: 8/29/86 BY: L. PIVONKA

TEST INTERVAL (FEET BELOW G.S.): 85.10 - 95.09

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 20.46

2(FI)(L)(H) R

1ST P1/3 TEST

Q = INJECTION RATE = .00054154 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.99 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 20.46 + 2.80 + 4.00 * 2.31 = 32.50

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000109 FT/MIN

K = .00000056 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00860736 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.99 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 20.46 + 2.80 + 19.00 * 2.31 = 67.15

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000842 FT/MIN

K = .00000428 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00000000 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.99 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 20.46 + 2.80 + 4.00 * 2.31 = 32.50

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .000000000 FT/MIN

K = .00000000 CM/SEC

Water Level Data for Rockwell (Rocky Flats)

Date Measured	Depth to Water from TOC	Elevation TOC (ft)	Water Level Elev. (ft)		
** Well Numbe	er: 3486				
09/05/86	22.38	5912.78	5890.40		
09/08/86	22.40	5912.78	5890.38		
09/09/86	22.63	5912.78	5890. 15		
09/10/86	22.77	5912.78	5890.01		
09/11/86	23.48	5912.78	5889.30		
09/12/86	24.25	5912.78	5888.53		
10/13/86	22.96	5912.78	5889.82		
11/26/86	22.77	5912.78	5890.01		
01/01/87	22.38	5912.78	5890.40		
02/01/87	22.17	5912.78	5890.61		
03/17/87	22.05	5912.78	5890.73		
05/08/87	21.98	5912.78	5890.80		
06/02/87	22.80	5912.78	5889.98		
07/07/87	21.65	5912.78	5891.13		
07/27/87	22.10	5912.78	5890.68		
08/04/87	22.40	5912.78	5890.38		
09/01/87	22.20	5912.78	5890. 58		
09/29/87	22.40	5912.78	5890.38		
11/03/87	23.50	5912.78	5889.28		
12/01/87	22.26	5912.78	5890.52		

INDEX OF DATA

Boring No.: 35-86							
Completed as well? Yes							
Data in File							
X_	Log of Borehole						
X_	Well Construction Summaries						
X_	Well Development Summaries						
x_	Hydraulic Conductivity Test Data						
	and Results						
	Packer Test Data and Results						
<u>X</u> _	Water Level Data						

Project No.

106P06222

Rocky Flats Plant

LOG OF BORING NO.

35-86

Date Drilled 8/19/86

Boring Method Hollow Stem Auger

Coordinates N 37177.0 E 23114.4

Ground Surface Elevation 5909.2

8011	iid war	70 u	IDIIOW	Stem Auger Ground Gd			
Elev. (feet)	Depth (feet)	Sempla Type	Graphic Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	Water Content 20 40	Other Tests
	0			VALLEY FILL ALLUVIUM	1111		
				0-2.0'-Sample.		-	
				Recovered 2.0/2.0'=100%.		_	
				CLAY: olive gray (5Y			
				3/2); dark yellowish		ا ا	
	-			orange (10YR 6/6) mot- tles; grades downward		-	
	_	r		into dark yellowish			
	-			brown (10YR 4/2) clay;			
				some silt; trace gravel and cobble size clasts		-	
				of quartzite and granite;		_	
				subangular to subrounded;		-	
1	5			dry to damp.			
	-						
		r .		2.0-2.7'-Sample. Recovered			
				0.7/0.7'=100%. CLAY: dark		. –	
				yellowish brown (10YR 4/2); dark yellowish orange		_	
				(10YR 6/6) mottles common;		_	
				some silt; trace gravel and			
	_			cobble size clasts of			
	-	/		quartzite and granite; subangular to subrounded;			
		Y,		dry to damp.		-	
						-	
	10			2.7-3.7'-Sample. Recovered		_	
·	10	/		0.0/0.7'=0%.			
				3.7-5.7'-Sample. Recovered			
	_	r /		2.0/2.0'=100%.			
	-			3.7-5.0'. CLAY: dark			
		Y,		yellowish brown (10YR 4/2);		-	
				dark yellowish orange		_	
				(10YR 6/6) mottles common;			
				some silt; trace gravel and		ن_	
	-			cobble size clasts of quartzite and granite;		-	
	_	Y /		subangular to subrounded;			
	_			dry to damp.			
	15	Υ.		enegi oray. Nebb		-	
				5.0-5.7'. CLAY: light olive gray (5Y 5/2); silty;		-	
		\vee		well sorted; consolidated;		_	
				firm; damp to moist.			
				S T C SI No semulo			
	_	r /		5.7-6.5'. No sample. Depth correction.			
	4			-		-	
		<u> </u>		6.5-8.5'-Sample. Recovered			
				1.7/2.0'=85%. CLAY: olive		-	
				black (5Y 2/1); silt;	1	_	
				trace sand and gravel; moderately well sorted;			
	20			soft; wet.			
_						Checked by:	114
Rema	ark8	Log	ged by:	T. Murphy		unecked by:	70-7

Hydro-Search, Inc.

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Rocky Flats Plant

LOG OF BORING NO.

Date Drilled 8/19/86

Boring Method Hollow Stem Auger

Coordinates N 37177.0 E 23114.4

Ground Surface Elevation 5909.2

	my met		.2110#	Stell Auger Ground Gr			
Elev. (feet)	Depth (feet)	Canti Type	Graphic Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	Content 20 40	Other Tests
	20						
				0.5.10.51.0		_	
				8.5-10.5'-Sample. Recovered 2.0/2.0'=100%.	i i		
	_			CLAY: olive black (5Y			
				<pre>2/1) to light olive gray (5Y 5/2); silty with</pre>			
•	-			gravel lenses; trace]	-	
	_			fine-grained sand;	-	_	
	_			poorly sorted; subangu- lar; firm; wet.		٦	
				Idi, IIIM, Wet.		-	
				ARAPAHOE FORMATION		-	
				ARAPANOE FORMATION		_	
	25					-	
				10.5-12.5'-Sample. Recovered 2.0/2.0'=100%.			
				CLAY: light olive gray			
				(5Y 5/2); dark yellowish			
				orange (10YR 6/6) mot- tles; sand layer at 12.0-			
	_			12.5'; fine-grained;			
	-			silty; moist; firm.			
	-			10 5-14 01-51-			
	_			12.5-14.0'-Sample. Recovered 1.5/1.5'=100%.		4	
	_			CLAYSTONE: light olive		-	
	30			gray (5Y 5/2); dark yellowish orange (10YR	i i	-	
	30			6/6) mottles; no gravel;		-	
				silty; firm; moist.			
				14.0-16.0'-Sample.		·	
				Recovered 2.0/2.0'=100%.		_	
				CLAYSTONE: light olive		_	
				gray (5Y 5/2); dark yellowish orange (10YR			
				6/6) mottles; no gravel;			
				silty; layers of iron-			
	-			stone; firm; moist.		٦	
	-			16.0-18.0'-Sample.		٦	
	35			Recovered 1.8/2.0'=90%.		٦	
				CLAYSTONE: pale olive (10Y 6/2) to light olive		-	
	-			gray (5Y 5/2); minor dark		4	
	-			yellowish orange (10YR 6/6) mottling; apparent			,
	_			bedding aue to color	[
	_			variations; firm;	1	4	
				damp to moist.	1 1		
1					l l	_	
				TOTAL DEPTH: 18.0'	į į		
				TOTAL DEFIR: 10.0]		
	40						
Rema	rks	Logg	ed by:	T. Murphy		Checked by: 🗴	

Project No.

106P06222

Hydro-Search, Inc.

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	21	· 0/		
WELL	- 4'	5-86		
W 1	J.	, ~	4	

		_ 0				WELL CONSTR	RUCTION S	UMM	ARY		
						LOCATION or COORDS:	ELEVATION: GROUN	O LEVEL		09.20' 11.54'	
						N 37177.0 E 23114.4		F CASING		11.54	
ı	1	- 2				DRILLING SUMMARY:	CONSTRUCTION	TIME	LOG:		
						TOTAL DEPTH Well: 11.60' Hole: 18.00'	TASK	<u>\$7/</u>	ART	FIN	ISH
					驑喜	BOREHOLE DIAMETER		DATE 1986	TIME	<u>DATE</u> 1986	TIME
		- 4				DRILLER Boyles Brothers Drilling Co.	DRILLING: 7/1 auger	8/19	1258	8/19	1558
		- 4				15865 W. 5th Avenue					
				≣		Colden, CO (Dave Jarvie) RIG Mobile B-57	GEOPHYS. LOGGING:				
				≣		BIT(S)T5	CASING:	0./00	1013	0 /20	1015_
8	hy	_6				DRILLING FLUID None	2" stainless	8/20	<u>1012</u>	_8/20 	
Golden,	Murphy							8/20	1015	8/10	1020
3	H			=		SURFACE CASING 5" x 5' steel w/ locking	FILTER PLACEMENT: CEMENTING:	8/20	1025	8/20	1040
Z	NE L	_ 8		≣		WELL DESIGN:	CEVELOPMENT:	9/3	1000	9/11	1155
OCATION	PERSONNEL					BASIS: GEOLOGIC LOG GEOPHYSICAL LOG	OTHER: Bentonite	8/20	1020	8/20	1025
207	PER					CASING STRING(S): C=CASING S=SCREEN	<u> </u>	8/20	1008	8/20	1012
						4.86' - 11.60' SI					
		-10				<u> </u>					
I	1				E		WELL DEVELOR	MENT		<u>' '</u>	
					E	<u> </u>	WELL DETERM				
							See Well Deve	lopment	Summar	y Sheet.	
		- 12			E F	CASING: CI 2" I.D. Sch. 5 type 316 stain-					
İ						c2 <u>less steel, threaded and flush</u>					
į					E	C4					
	Plant	-14				SCREEN: SI 2" I.D. Sch. 5 type 316 stain— s2 less steel, threaded and flush					
	ts				Ē	s2 less steer, threaded and Itush	COMMENTS:				
622	FIS				E	54 0.25' welded bottom cap.	Water encount	ered at	8.0' d	uring dr	illing.
106P06222	Rocky Flats	1,0				CENTRALIZERS Type 304 stainless steel 7.80' - 8.85'	Top of stainl	ess ste	el casi	ng: 2.3	4 '
		_16			Ē			·····			
PROJECT					Ę	FILTER MATERIAL 16-40 silica sand 2.90' - 12.60'	Cave from TD	to 14.2	.0		
7					E	CEMENT Portland Type I					
		_18			4	0.00' - 1.95'		<u></u>			
						OTHER 3/8" bentonite pellets 1.95' - 2.90'					
						12.60' - 14.20'					
		-20				HYDRO-SEARCH RENO-DENVER	CONSULTING H	YDROL	OGISTS	GEOL	OGISTS

WEL	L	3586
77		

WELL DEVELOPMENT SUMMARY

DATE	TIME	METHOD	VOLUME	APPEARANCE	COMMENTS
9-3-86	1000				i Well Bore Volume = .74 gals. 10 Well Bore Volumes = 7.4 gals.
9-3-86	1000	Bailed	2 gals.	Light yellowish brown, turbid	Sandy, silty - sand in bailer 2/7.4 gals. purged to date
9-8-86	1635	Airlifted		Light brown	Airlifted for 1 hour Begin - 0.89 gals., end - 0.4 gals.
9-9-86	1425	Bailed	1.3 gals.	Light brown	3.3/7.4 gals. purged to date
9-10-86	1630	Bailed	2.5 gals.	Light brown	5.8/7.4 gals. purged to date
9-11-86	1155	Bailed	1.75 gals.	Light brown to clear, slightly turbid	7.5/7.4 gals. purged to date
9-12-86	1330	Bailed		Light brown to clear	Sampled
	·				
		·			
·					
				·	
,					
				· .	

AQUIFER TEST DATA

WELL 35-86

Type of Aquifer Test: Bail down - Recovery How Q Measured: 4.5 gallon bucket

How W.L.'s Measured: Olympic Well Sounder Measuring Point for W.L.'s: Top of Casing Elevation of Measuring Point: 5914.62' Project No.: 106P06222 Location: Rocky Flats Plant Personnel: W. Herst, D. Pavlick

Depth of pump/airline: N/A

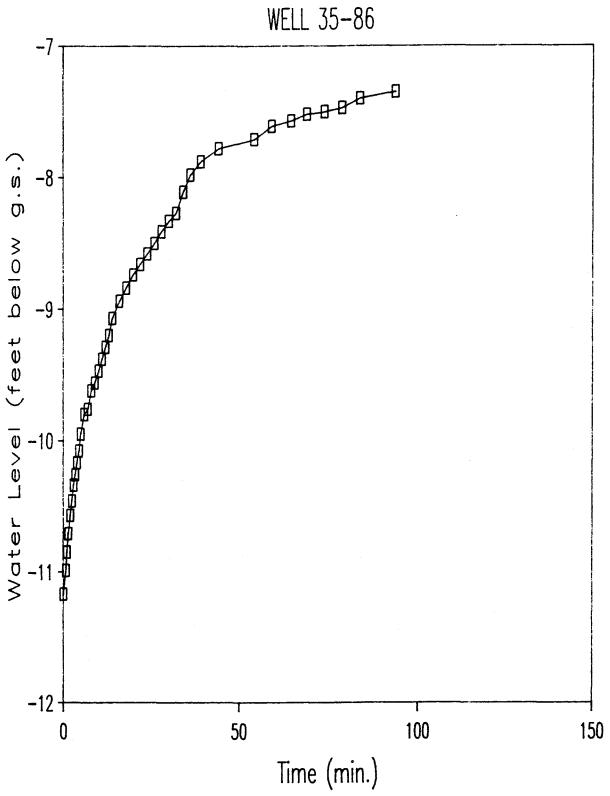
Start bailing: 9/25/86 Time: 1255:00 Stop bailing: 9/25/86 Time: 1301:00 Duration of Aquifer Test: 110 minutes

TIME t = 6 at t' = 0			R LEVEL DATA Mater Level: 6.	COMMENTS 94
t	t'	Water Level	Draw- down	
0 .8 4.5 6.0	0_	6.94		Begin bailing Bailed 1 gallon Bailed 0.5 gallon Stop bailing
6.8	.8	11.17	4.23	Takas Jack - 14 /8
7.1	1.1	10.99	4.05	Total depth = 11.64
7.5	1.5	10.85	3.91	
8.0	2.0	10.71	3.77	
8.5 9.0	2.5 3.0	10.57	3.63	
7.0 9.5	3.5	10.46 10.34	3.52 3.40	
10.0	4.0	10.34	3.32	
10.5	4.5	10.28	3.23	
11.0	5.0	10.17	3.14	
12.0	6.0	9.95	3.01	
13.0	7.0	7.73 9.80	2.86	
14.0	8.0	9.76	2.82	
15.0	9.0	7.70 9.62	2.68	
16.0	10.0	9.56	2.62	
17.0	11.0	9.47	2.53	
18.0	12.0	9.38	2.44	
19.0	13.0	9.29	2.35	
20.0	14.0	9.20	2.26	
22.0	16.0	9.07	2.13	
24.0	18.0	8.94	2.00	
26.0	20.0	8.84	1.90	
28.0	22.0	8.74	1.80	
30.0	24.0	8.66	1.72	
32.0	26.0	8.58	1.64	
34.0	28.0	8.50	1.56	
36.0	30.0	8.41	1.47	
38.0	32.0	8.33	1.39	
40.0	34.0	8.27	1.33	
42.0	36.0	9.11	1.17	

45.0	39.0	7.98	1.04	
50.0	44.0	7.88	.94	
60.0	54.0	7.78	. 84	
65.0	59.0	7.71	.77	
70.5	64.5	7.61	. 67	
75.0	69.0	7.57	.63	
80.0	74.0	7.52	. 58	
85.0	79.0	7.50	.56	
90.0	84.0	7.47	.53	
100.0	94.0	7.40	.46	
110.0	104.0	7.35	.41	

90% recovered at 7.41'

AQUIFER TEST DATA



PROGRAM SLUGT, VERSION 4,0CT. 1985

THIS PROGRAM CALCULATES MEAN TRANSMISSIVITIES FROM SLUG-TEST DATA BASED ON TWO ANALYTICAL APPROACHES:

- (1) METHOD OF COOPER, BREDEHOEFT AND PAPADOPULOS, 1967 (ARTICLE IN VOL.3, NO.1 OF WAR ENTITLED
 - "RESPONSE OF A FINITE DIAMETER WELL TO AN INSTANTANEOUS CHARGE OF WATER")
- (2) METHOD OF BOUWER AND RICE, 1976 (ARTICLE IN VOL. 12, NO.3 OF WAR ENTITLED "A SLUG TEST FOR DETERMINING HYDRAULIC CONDUCTIVITY OF UNCONFINED AGUIFERS WITH COMPLETELY OR PARTIALLY PENETRATING WELLS")

PROJECT NO.: 6-0118-87

CLIENT: Rockwell International

ITE LOCATION: Rocky Flats Plant

DATE OF SLUG TEST: 10-14-87

FIELD INVESTIGATOR: Kevin McNeill

WELL NO .: 35-86

INPUT DATA ARE:

INNER CASING DIAMETER = 2.00 INCHES

INNER SCREEN OR OPEN-HOLE DIAMETER = 2.00 INCHES

DEPTH
DIAMETER OF DRILLED HOLE = 7.25 INCHES

ESTIMATED POROSITY OF GRAVEL PACK = .25

NUMBER OF HEAD-TIME DATA POINTS = 39

LENGTH OF SCREEN OR INTAKE PORTION = 4.59 FEET
DEPTH FROM STATIC LEVEL TO BOTTOM OF SCREEN = 4.59 FEET
THICKNESS OF SATURATED AQUIFER ZONE = 4.59 FEET
FALLING-HEAD INDEX = 0 ("1" IF FALLING."0" IF RISING)

TIME	HEAD
(sec)	(FEET)
1.00	. 630
2.00	.610
3.00	.600
4.00	.590
5.00	.590
6.00	.580
7.00	.570
8.00	.540
9.00	.560
10.00	. 550
15.00	. 520
20.00	.500
25.00	. 480
35.00	. 440
45.00	.410
55.00	. 380
65.00	. 340
85.00	.320
105.00	.300
125.00 145.00	.280 .270
175.00	.270
205.00	
235.00	.240 .230
265.00	.230
295.00	.220
355.00	.210
415.00	.200
535.00	.190
655.00	.170
775.00	.160
895.00	. 150
1015.00	. 150
1135.00	.140
1465.00	.120
1945.00	.110
2425.00	.100
2905.00	. 090
3505.00	.080

HO WAS COMPUTED FROM INTERCEPT OF PLOT OF LOG(H) VS. TIME

SUCCESSIVE COMPUTED VALUES FOR HO (FEET)

.3883

.3987

METHOD OF BOUNER AND RICE

COMPUTED RESULTS USING DIAMETER OF DRILLED HOLE:

PERMEABILITY = 4.57E-06 FT/sec = 1.39E-04 CM/sec

TRANSMISSIVITY = 2.10E-05 FT++2/sec

COMPUTED RESULTS USING DIAMETER OF CASING AND SCREEN:

PERMEABILITY = 1.75E-06 FT/sec = 5.34E-05 CM/sec

TRANSHISSIVITY = 8.04E-06 FT##2/sec

Water Level Data for Rockwell (Rocky Flats)

Date Measured	Depth to Water from TOC	Elevation TOC (ft)	Water Level Elev. (ft)
** Well Numbe	r: 3586		
09/03/86	9.35	5911.54	5902.19
09/08/86	9.04	5911.54	5902.50
09/09/86	9.14	5911.54	5902.40
09/10/86	9.16	5911.54	5902.38
09/11/86	9.24	5911.54	5902.30
09/12/86	9.29	5911.54	5902.25
10/13/86	9.13	5911.54	5902.41
11/26/86	9.47	5911.54	5902.07
01/01/87	9.38	5911.54	5902.16
02/01/87	8.96	5911.54	5902.58
03/17/87	6.50	5911.54	5905.04
05/08/87	6.00	5911.54	5905.54
06/02/87	7.90	5911.54	5903.64
07/07/87	6.70	5911.54	5904.84
07/27/87	8.10	5911.54	5903.44
08/04/87	6.40	5911.54	5905.14
09/01/87	8.60	5911.54	5902.94
09/29/87	9.00	5911.54	5902.54
11/03/87	8.80	5911.54	5902.74
12/01/87	8.40	5911.54	5903.14

INDEX OF DATA

Boring No.: 36-86					
Comple	Completed as well? Yes				
Data in	ı File				
<u> </u>	Log of Borehole				
<u> X</u>	Well Construction Summaries				
<u>X</u>	Well Development Summaries				
	Hydraulic Conductivity Test Data				
	and Results				
	Packer Test Data and Results				
X_	Water Level Data				

Rocky Flats Plant

LOG OF BORING NO.

36-86

Date Drilled 8/25/86

Boring Method Hollow Stem Auger

N 37395.4 E 23715.3 **Ground Surface Elevation**

Boring Method Hollow Stem Auger Ground Suited Lievation 5001:54							
Elev. (feet)	Depth (feet)	Sempla Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40		Other Tests
	0			VALLEY FILL ALLUVIUM		1111	
		Y //					
	-	/ / /	=====	0-0.3'-Sample. Recovered 0.3/0.3'=100%.		-	
		//		CLAY: moderate yellowish		-	
		V/I		brown (10YR 5/4); silty;		_	
		$\angle A$		poorly sorted;			
	1 1			unconsolidated; damp.			
	-	Y/A		0.3-4.3'-Sample.			
	1 4	Y/,		Recovered 2.0/4.0'=50%.		-	
1				CLAY: light brown (5YR		_	
				5/6) and dark yellowish			
			00	brown (10YR 4/2); silty; some granitic cobbles;			
	— 5 —	/ //		trace iron concretions;			
	4	$\angle \angle A$	$2^{\circ \circ \varsigma}$	\poorly sorted;		-	
		//]		unconsolidated; damp.		_	
				4 3-5 51-Cample		ا_	
		//		4.3-5.5'-Sample. Recovered 0.9/1.2'=75%.			
	-			GRAVEL: dark yellowish			
	4			brown (10YR 4/2); granitic		-	
				pebbles and cobbles; silty		_	
				and clayey; trace iron concretions; poorly			
	1			sorted; unconsolidated;			
	I →	///		damp.		_	
	4					-4	
	— 10—			ARAPAHOE FORMATION		_	
	10			5.5-8.0'-Sample.			
	7			Recovered 2.5/2.5'=100%.			
	-			CLAYSTONE: medium light			
	-			gray (N 6) and light olive gray (5Y 4/1); trace iron			
				staining; weathered;		_	
				consolidated; moist.	ł	_	
	7						
	-			8.0-10.2'-Sample. Recovered 2.2/2.2'=100%.	1	٦	
	_			CLAYSTONE: dark yellowish		-	
	_			orange (10YR 6/6); some		4	
				medium light gray (N 6);		_	
	,,			sandy with 30-40% iron staining; consolidated;			
	15			moist.			
	-					-	·
					1		
				TOTAL DEPTH: 10.2'		4	
	-						
	_					-	
					j i	-	
	20					, , , , , ,	
						Charles & Lee	1.00)
Remarks Logged by: L. Pivonka Checked by:							

Project No.

106P06222

Hydro-Search, Inc.

Page 1 of 1

WELL	3 6-8 6	

			1/4	園 WELL CONSTR	UCTION S	UMM	IARY		
				LOCATION of COORDS:	ELEVATION: GROUP	NO LEVE	58	81.94'	
				LOCATION or COORDS:	TOP O	F CASIN	G 58	83.78	
		- 2	411.	를 DRILLING SUMMARY:	CONSTRUCTION	TIME	LOG:		
		-	雛雞	TOTAL DEPTH Well: 6.50' Hole: 10.20'	7404	ST	ART	FIN	ISH
				BOREHOLE DIAMETER	TASK	DATE 1986	TIME	DATE 1986	TIME
			∭ ≡		DRILLING:	1		1	1500
		L ₄		DRILLER Boyles Brothers Drilling Co.	7½" auger	8/25	1014_	8/25	1520
				Golden, CO (Jim Horn)					
				RIG Mobile B-57	GEOPHYS. LOGGING:				
_				BIT(S) T-5	CASING:				
8	Pivonka	L ₆		3	2" stainless	8/25	1523	8/25	1525
Colden,	Piv	١	=	DRILLING FLUID None	-				
8	1			<u> </u>		0./05	1505	0/25	1520
				SURFACE CASING 5" x 5' steel w/ locking	FILTER PLACEMENT:	8/25	1525 1533	8/25 8/25	1530 1546
	딜		13	WELL DESIGN:	CEMENTING: CEVELOPMENT:	8/27	1120	9/3	1055
OCATION	PERSONNEL	-8		BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG	OTHER:		-112		
CA	ERS			CASING STRING(S): C=CASING S=SCREEN	Bentonite	8/25	1530_	8/25	1533
۲	₹			喜 <u>0.00' 3.50' Cl </u>		8/25	1520	8/25	1523
				3.50' - 6.49' SI					
		-10		g					
1	1			7					
]		WELL DEVELOP	MENT			
		-12			See Well Develo	pment S	ummary	Sheet.	
		"-		CASING: CI 2" I.D. Sch. 5 type 316 stain-					
	int		1	less steel, threaded and flush					
	Plar		1	jointed.					
		_14	1	SCREEN: SI 2" I.D. Sch. 5 type 316 stain-					
106P06222	Rocky Flats	14	1	less steel, threaded and flush	2011151170				
<u>6</u>	돯		l	jointed, 0.010" wire wrap screen	COMMENTS:				
의	S.			0.25' welded bottom cap.	No water encoun	tered d	uring d	rilling.	
				CENTRALIZERS Type 304 stainless steel	Top of stainles	a stool	ancina	. 1 .84	
		_16		4.42' - 5.59'	100 of standes	S SLEET	Casing	. 1.04	
PROJECT				FILTER MATERIAL 32-42 silica sand					
P ₀				2.50' - 7.00'					
۵	'			CEMENT Portland Type I					
		- 18		0.00' - 2.00'					
			1	OTHER 3/8" bentonite pellets 2.00' - 2.50'					
			l	7.00' - 10.20'					
		- 20							
	l			HYDRO-SEARCH RENO-DENVER	CONSULTING HY	DROLC	GISTS	-GEOLO	GIST

WEL	L	36-86
WEL		

WELL DEVELOPMENT SUMMARY

1 Well Bore Volume = 0.86 gals. 10 Well Bore Volume = 0.86 gals. 10 Well Bore Volume = 8.6 gals. 10 Well Bore Volume = 9.6 gals. 10	DATE	TIME	METHOD	VOLUME	APPEARANCE	COMMENTS
8-27-86 1120 Bailed 2.0 gals. brown in color — 9-3-86 1055 — — — Dry - Dry sand on bottom	8–27–86	1120		·		Well Bore Volume = 0.86 gals. 10 Well Bore Volumes = 8.6 gals.
	8-27-86	1120	Bailed	2.0 gals.	Very muddy, brown in color	
	9-3-86	1055		-		<u>Dry</u> - Dry sand on bottom
		·				
		·			·	
				:	·	
	,					
					·.	

12/11/87

Water Level Data for Rockwell (Rocky Flats)

Date Measured	Depth to Water from TOC	Elevation TOC (ft)	Elev. (ft)	
** Well Numbe	r: 3686	**************************************		
08/27/86	9.28	5883.78	5874.50	
09/03/86	-1.00	5883.78		
10/13/86	-1.00	5883.78		
11/26/86	-1.00	5883.78		
01/01/87	7.02	5883.78	5876.76	
02/01/87	6.17	5883.78	5877.61	
05/06/87	6.08	5883.78	5877.70	
06/01/87	5.83	5883. 78	5877.95	
07/0 8/87	5.65	5883.78	5878.13	
07/27/87	5.80	5883.78	5877.98	
08/04/87	7.00	5883.78	5876.78	
09/01/87	5.80	5883.78	58 77.98	
09/28/87	7.60	5 883.78	5876.18	
11/03/87	7.70	5883.78	5876.08	
12/01/87	7.65	5883.78	5876.13	

INDEX OF DATA

Boring	No.: 39-86
Comple	ted as well? Yes
Data in	File
X	Log of Borehole
<u> </u>	Well Construction Summaries
<u> </u>	Well Development Summaries
<u> </u>	Hydraulic Conductivity Test Data
	and Results
	Packer Test Data and Results
X	Water Level Data

Rocky Flats Plant

LOG OF BORING NO.

Date Drilled 9/11/86

Boring Method Hollow Stem Auger

Coordinates N 38288.7

			, , , , -
Ground	Surface	Elevation	5904.91

	ING MALI		INITION	Stem Auger Ground Go	TIECO CIOVELL		
Elev. (feet)	Depth (feet)	Sempla Type	Graphic Lóg	Material Description	Penetration Resistance (Blows/Inch) 20 40	Content	Other Tests
	0	//	7000	ROCKY FLATS ALLUVIUM			
1 <i>j</i>	1 7	$V \lambda$	600	0-0.5'-Sample.	1	, 7	
1 <i>j</i>	1 →		6700.	0-0.5'-Sample. Recovered 0.2/0.5'=40%.	1	, 7	T
4 <i>j</i>	1 -1	1/1	5000	GRAVEL: grayish brown	!	, →	T
4 /	1 -1	Y //	P. 0	(5YR 3/2); granitic pebbles and cobbles;	1 1	! →	1
4 <i>j</i>	1 7	// /	0.0	silty; poorly sorted;	1	1 -1	Į l
1 1	1 _7	Y /	000	unconsolidated; damp.	1 1	ا_ ا	y 1
1 1	1 7	$V \Lambda$	0%	_	1 · · · · · · · · · · · · · · · · · · ·	1	Į :
1	1 -1		D.O.	0.5-2.5'-Sample. Recovered 0.0/2.0'=0%.	1	1 1	Ţ .
4)	1 -1		10°.9	,	4 7	1 -1	Į l
4 1	1 -1	r //	Og 8	2.5-3.0'-Sample.	1 1	, ⊸	Ţ
1 I	 5	// 1	5.00°	Recovered 0.5/0.5'=100%. GRAVEL: grayish brown	4 1	१ —⁴	Ţ
1 I	ال ا	//	0.00	(5YR 3/2); granitic	4 · 7	1 4	Ŋ İ
1)	1 _1		800	pebbles and cobbles;	1 1	1	Į l
i y	1 7		600	silty; some caliche stringers; poorly sorted;	t 1	1	Ţ İ
1 1	1 1		$\sim \sim \sim$	unconsolidated; damp.	1 1	, J	Į l
t p	1 -1		0.0	-	t I	1 -	Į l
1 1	1 -		500.5	3.0-5.0'-Sample. Recovered 0.5/2.0'=25%.	1 1	-	Ţ
l p	1 -	///	0000	GRAVEL: dark yellowish	1 1	· -	Ţ
1 1	L 1	V / /	0.0	orange (10YR 6/6);	ų l	1 -4	
1 1		// 1	e 00°	granitic pebbles and cobbles; clayey; caliche	1 1	!_	ļ
i p	1 7	//	$\cup^{o}\circ \cap I$	stringers; some iron	t 1	1	1
1 1	1 1		0000	staining; poorly sorted;	4 . 1	7	, <u>I</u>
y f	10-			unconsolidated; damp.	į į	1	ļ
1 1	· -	//		5.0-10.0'-Sample.	1 1	-	
ı I	' -	///		Recovered 1.8/5.0'=36%.	į į	4	
1 P	J	//]		GRAVEL: Same as above;	į į	١ -	
ŋ I				damp.	į į	!.	
1 I	1			10.0-12.5'-Sample.	, ,	7	
1 I	1	//		Recovered 1.5/2.5'=60%.	1 1	· 1	
1 I		//		CLAY: dark yellowish orange (10YR 6/6); sandy;	۱ ·)	1	
1	·	///		some granitic cobbles;	,		
1 1		//]		caliche stringers; poorly	, ,		
1	ل '	//]		sorted; unconsolidated; moist.	, I		
	— 15 —				Ţ. J	·	
	- 13	//		12.5-16.8'-Sample. Recovered 1.5/4.3'=35%.	1 1	7	
	1	//		CLAY: Same as above;	1 1	1	
				moist.	, i	-1	
		//		i	, 1	-	
	ᅪ			16.8-22.5'-Sample.	, 1		
ı	7	//1		Recovered 2.2/4.7'=47%. CLAY: Same as above;	t y	4	
I		//1		CLAY: Same as above; moist.	1 1	Ĺ	
1	7			<u>.</u>	, 1		
	1				1	7	
1	- 1	//	E	·	ţ I	7	
ł	20				1 , , , , 1	_	
			<u> </u>				ND
Remai	rk8	Logge	ed by: 1	L. Pivonka		Checked by:	THE

Project No.

106P06222

Hydro-Search, Inc.

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Project No.

106P06222

Rocky Flats Plant

LOG OF BORING NO. 39-86

Date Drilled 9/11/86

Boring Method Hollow Stem Auger

Coordinates N 38288.7 E 27591.8

Ground Surface Elevation 5904.91 Penetration Resistance Other Depth Sample Graphic (feet) Type Log Elev. (feet) Material Description Tests (Blows/inch) 20 22.5-27.5'-Sample. Recovered 1.2/5.0=24%. CLAY: Same as above; moist. 27.5-30.5'-Sample. Recovered 0.2/3.0'=6%. CLAY: Same as above; moist. ARAPAHOE FORMATION 30.5-32.5'-Sample. Recovered 2.0/2.0'=100%. CLAYSTONE: light gray (N 7); dark yellowish brown (10YR 6/6) mottling; consolidated; weathered; 32.5-35.0'-Sample. Recovered 2.0/2.5'=80%. CLAYSTONE: dusky yellowish brown (10YR 2/2); trace iron staining; consolidated; unweathered; damp. 35.0-37.0'-Sample. Recovered 2.0/2.0'=100%. CLAYSTONE: dusky yellowish brown (10YR 2/2); trace iron staining; consolidated; damp. TOTAL DEPTH: 37.0' Remarks Logged by: L. Pivonka Checked by:

Hydro-Search, Inc.

Page 2 of 2

WEL	ı	39-86	

		10				WELL CONSTRU	UCTION S	UMM	IARY		
						LOCATION or COORDS:	ELEVATION: GROUP	ND LEVE	59 G59	04.91' 06.61'	
		_5			6		CONSTRUCTION		LOG:	FIN	<u>ISH</u>
					2	BOREHOLE DIAMETER	TASK	<u>DATE</u> 1986	TIME	<u>DATE</u> 1986	TIME
		10			D	DRILLER Boyles Brothers Drilling Co. 15865 W. 5th Avenue	DRILLING: 건년 auger	9/11_	_1615_	9/12	1520
0	8						GEOPHYS. LOGGING: CASING:				
Golden, CO	L. Pivonka	15		пиши		DRILLING FLUIDNone	2" stainless	<u>9/13</u>		9/13	0850
				шшшш		WELL DESIGN:	FILTER PLACEMENT: CEMENTING:	9/13	0850 0910	9/13 9/13	0905 0925
LOCATION	PERSONNEL	20				BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG C CASING STRING(S): C=CASING S=SCREEN	CEVELOPMENT: OTHER: Bentonite	9/16	0905	9/22	0910
_		25				0.00' 5.00' C1		_9/13_ 	0847_	9/13	_0850
							WELL DEVELOP	MENT]	
	Į.	-3 0				CASING: CI 2" I.D. Sch. 5 type 316 stain- less steel, threaded and flush	See Well Develo	opment S	Summary	Sheets.	
22	Flats Plant	.35				SCREEN: SI 2" I.D. Sch. 5 type 316 stain- less steel, threaded and flush					
106P06222	Rocky I		·			jointed, 0.010" wire wrap screen 0.25' welded bottom cap. CENTRALIZERS Type 304 stainless steel	Water encounter	ed at 2	25.5' du	ring dri	llling
		40				18.31' - 19.49'	Top of stainles	s steel	casing	: 1.70	
PROJECT						FILTER MATERIAL 32-42 silica sand 4.00' - 31.75' CEMENT Portland Type I	Cave from TD to	35.80			
		-45				0.00' - 3.00' OTHER 3/8" bentonite pellets 3.00' - 4.00'					
						21.75' - 35.80'					
		-50				HYDRO-SEARCH RENO-DENVER C	CONSULTING HY	DROLO	GISTS-	GEOLO	GIST

WELL DEVELOPMENT SUMMARY

DATE	TIME	METHOD	VOLUME	APPEARANCE	COMMENTS
9-16-86	1314				<pre>1 Well Bore Volume = 1.17 gals. 10 Well Bore Volumes = 11.7 gals.</pre>
9-16-86	1314	Bailed	6 gals.	Turbid, medium brown	Sandy & silty, thick 6/11.7 gals. purged to date
9-17-86	1345	Bailed	ll gals.	Light brown, turbid	Sandy 17/11.7 gals. purged to date
9-17-86	1745	Airlifted			Water mist is clear to light gray, no mud comes up casing
91886	1350	Bailed	20 gals.	Turbid, medium brown	
9-1 9- 86	1145	Pumped and Bailed	54 gals.	Turbid - light to medium brown	Less turbid, not ready to sample 91/11.7 gals. purged to date
9-22-86	1000	Pumped and Bailed	38 gals.	Initially brown, then to light gray	Less turbid as bailing progresses 129/11.7 gals. purged to date
9-22-86	1300	Bailed	_	Initially brown, then to light gray	Sampled
	·				
	·				

AQUIFER TEST DATA

WELL 39-86

Type of Aquifer Test:

Constant Discharge

How Q Measured: 4.5 gallon bucket

How W.L.'s Measured:

Olympic Well Sounder

Measuring Point for W.L.'s:

Top of Casing

Elevation of Measuring Point: 5914.1

Depth of pump/airline:

Pump on:

9/25/86

Time:

1130:00

Pump off:

9/25/86

Time: 1138:11

Duration of Aquifer Test:

110 minutes

TIME

WATER LEVEL DATA

COMMENTS

t = 8.2

at t' = 0

Static Water Level: 23.85

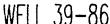
Project No.: 106P06222

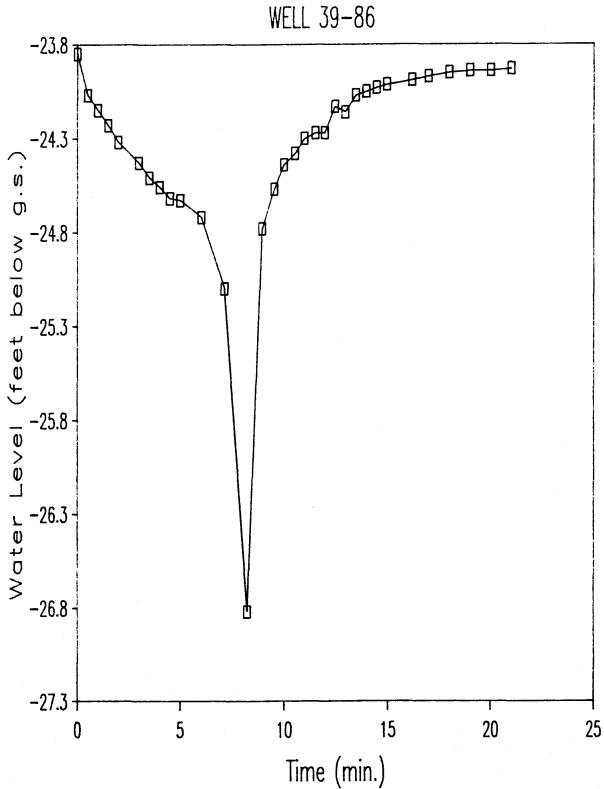
Location: Rocky Flats Plant

Personnel: W. Herst, D. Pavlick

t .	t'	Water Level	Braw- down	
0		23.85		Pump on
.5		24.07	.22	·
1.0		24.15	. 30	Total depth = 30.80'
1.5		24.23	.38	•
2.0		24.32	.47	
3.0		24.43	.58	1.41 gpm
3.5		24.51	.66	
4.0		24.56	.71	
4.5		24.62	.77	
5.0		24.63	.78	1.55 gpm
6.0		24.72	.87	
7.1		25.10	1.25	
8.2	0	26.82	2.97	1.45 gpm
8.9	.7	24.78	.93	Pump off at 8.2 minutes
9.5	1.3	24.57	.72	•
10.0	1.8	24.44	.59	
10.5	2.3	24.38	.53	
11.0	2.8	24.30	. 45	
11.5	3.3	24.27	.42	
12.0	3.8	24.27	.42	
12.5	4.3	24.13	. 28	
13.0	4.8	24.16	.31	
13.5	5.3	24.07	.22	90% recharged at
14.0	5.8	24.05	.20	24.15
14.5	6.3	24.03	.18	
15.0	6.8	24.01	. 16	
16.2	8.0	23.99	.14	
17.0	8.8	23.97	.12	
18.0	9.8	23.95	.10	
19.0	10.8	23.94	.09	
20.0	11.8	23.94	.09	·
21.0	12.8	23.93	.08	

AQUIFER TEST DATA





12/11/87

Water Level Data for Rockwell (Rocky Flats)

Date Measured	Depth to Water from TOC	Elevation Water Lo TOC (ft) Elev. (
** Well Numbe	r: 3986		
09/16/86	25.17	5906.61	5881.44
09/17/86	25.38	5906.61	5881,2 3
09/18/86	25.38	5906.61	5881.23
09/19/86	25.40	5906.61	5881.21
09/24/86	25.38	5906.61	5881.23
10/13/86	25.57	5906.61	5881.04
11/26/86	25.82	5906.61	5880.79
01/01/87	5.92	5906.61	5900.69
02/01/87	25.63	5906.61	5880.98
04/01/87	25.79	5906.61	5880.82
05/06/87	24.67	5906.61	5881.94
06/01/87	24.75	5906.61	5881.86
07/07/87	24.75	5906.61	5881.86
08/04/87	24.90	5906.61	5881.71
09/01/87	25.20	5906.61	5881.41
09/03/87	25.50	5906.61	5881.11
09/03/87	25.20	5906.61	5881.41
09/28/87	24.40	5906.61	5882.21
11/03/87	25.50	5906.61	5881.11
12/01/87	25.55	5906.61	5881.06

INDEX OF DATA

Boring	No.: 40-86
Comple	ted as well? Yes
Data in	File
X_	Log of Borehole
<u> </u>	Well Construction Summaries
X	Well Development Summaries
	Hydraulic Conductivity Test Data
	and Results
<u>X</u>	Packer Test Data and Results
X	Water Level Data

Project: Rocky Flats Plant

LOG OF BORING NO.

Date Drilled Boring Method

9/23/86

Casing Driver/NC Core

N 36612.8

Ground Surface Elevation

E 25398.1 5941.23

301	ng Method	Casing	briver/NC Core Ground Su	TIACO EIOVAL		_
Elev. (feet)	Depth Sen (feet) Ty	pe Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	Content Content 20 40	Other Tests
	0	35,5	ROCKY FLATS ALLUVIUM	1111		
		_:C	0-2.0'-Cuttings. GRAVEL:			
		000	50% quartzite cobbles and			
		000	50% silty sand; poorly			
		-38 g	<pre>sorted; unconsolidated; dry.</pre>			
		5000	- -			
		$\neg k \bigcirc \cdot$	2.0-4.0'-Cuttings. BOULDER: large quartzite			
	1	300	boulder; dry.			i
		7,85	4.0-19.0'-Cuttings.			
ı	-	0.0	GRAVEL: moderate brown			
	 5'	->:0°19	(5YR 4/4); 60% granitic			
	-		pebbles and cobbles and 40% silty sand; poorly		-	
		-6:77	sorted; unconsolidated;		-	
	· -	50.00	damp.		·	
ı		000			_	
	4	$\mathring{\mathcal{O}}$			-	
·					_	
ı		000			_	
ı		0.0%			_	
- 1		2.00	· ·			•
	_10 _	40.85				
	- 10 -	60.	-			
	7	$\mathcal{O}_{\mathcal{I}}^{v}$				
		- 200.3				
	1	05				
		1000			7	
1	4	000			1	
	-	- ००० व				
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		- 6° 9°				
•		5.00				
-	— 15 —	_;°,°				
	4	000			4	
		B ().5	i		4	
1	4	हुं ००			4	
		\tilde{O}				
J		10:3			ا ا	
J		105	19.0-23.0'-Cuttings.	· •	L	
J		2.0	BOULDERS: quartzite boulders and cobbles;		\mathbf{I}	
ľ	1	10.3	poorly sorted;	I		
1		Po	unconsolidated; dry.		7	
	20	0.00			1	
Remar	ks	Logged 1	by: T. Gulliver & L. Pivonka		Checked by:	JA
		00-3				-

Project No. 106P06222

Hydro-Search, Inc.

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LOG OF BORING NO. Project: Rocky Flats Plant 40-86 Coordinates N36612.8 9/23/86 **Date Drilled** E 25398.1 Casing Driver/NC Core **Boring Method Ground Surface Elevation** 5941.23 Penetration Resistance Other Depth Sample Graphic (feet) Type Log Elev. (feet) Material Description Tests (Blows/inch) 20 0.0 000 23.0-28.0'-Cuttings. GRAVEL: moderate brown (5YR 4/4); granitic pebbles and sand; silty; 000 poorly sorted; unconsolidated; damp. 20.0 28.0-30.0'-Cuttings. GRAVEL: moderate brown (5YR 4/4); 20% granitic pebbles and cobbles; silty; poorly sorted; unconsolidated; damp. 30.0-31.0'-Cuttings. 00 (BOULDER: large granite boulder. 31.0-38.0'-Cuttings. GRAVEL: moderate brown (5YR 4/4); 30-40% granitic cobbles; sandy; silty; poorly sorted; unconsolidated; damp. 00 38.0-41.0'-Cuttings. SAND: moderate brown (5YR 4/4); coarse to very fine-grained; poorly sorted; unconsolidated; damp. 40 Remarks Checked by: Logged by: T. Gulliver & L. Pivonka Project No. Hydro-Search, Inc. 106P06222 Page 2 of 7

Rocky Flats Plant

LOG OF BORING NO.

Date Drilled

9/23/86

N 36612.8

E 25398.1

Boring Method Casing Driver/NC Core **Ground Surface Elevation**

Borin	ig Method	Casing	Driver/NC Core Ground 80	irtace Elevati	on 5941.23	
Elev. (feet)	Depth Semp (feet) Typ	de Graphic e Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	Content 20 40	Other Tests
	40 -	C C C C C C C C C C C C C C C C C C C	41.0-42.0'-Cuttings. GRAVEL: moderate brown (5YR 4/4); ~30% quartzite cobbles; sandy; silty; poorly sorted; unconsolidated; damp. 42.0-44.0'-Cuttings. BOULDERS: granitic cobbles and boulders; poorly sorted; subangular to subrounded; damp. 44.0-45.0'-Cuttings. SILT: moderate brown (5YR 4/4); 85-90% silt; trace granitic pebbles (subangular to subrounded); poorly			
			subrounded); poorly sorted; damp. ARAPAHOE FORMATION 45.0-50.0'-Cuttings. CLAYSTONE: dark yellowish brown (10YR 4/2); light olive gray (5Y 4/4) streaks; consolidated; damp. 50.0-51.0'-Cuttings. SILTSTONE: medium gray (N 5); clayey; well sorted; non-calcareous; dry.			
	-55 -		51.0-53.0'-Cuttings. CLAYSTONE: dusky yellowish brown (10YR 2/2); silty; consolidated; damp.			
Remar	60 - ks	Logged	58.3-61.2'-Sample. Recovered 2.0/2.9'=69%. CLAYSTONE: dark gray (N 4);silty; unweathered; trace iron staining; consolidated; moist. by: T. Gulliver & L. Pivonka	1111	Checked by:	JHP.

Project No.

106P06222

Hydro-Search, Inc.

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Rocky Flats Plant

LOG OF BORING NO.

Date Drilled
Boring Method

9/23/86

Casing Driver/NC Core

Coordinates N 36612.8

E 25398.1

40-86

Ground Surface Elevation 5941.23

Born	ng Met	Don	Casing	briver/ic wie			
Elev. (feet)	Depth (feet)	Semple Type	Graphic Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	Content 20 40	Other Tests
	65 1 1 1 1 1 1 1 1 1			61.2-66.2'-Sample. Recovered 4.3/5.0'=86%. CLAYSTONE: dark gray (N 3); trace of grayish orange (10YR 7/4) mottling; trace of coal; blocky texture; consolidated; moist. 66.2-69.2'-Sample. Recovered 2.4/3.0'=80%. CLAYSTONE: Same as above; moist.			
	70			69.2-71.2'-Sample. Recovered 1.8/2.0'=90%. CLAYSTONE: Same as above; moist. 71.2-73.7'-Sample. Recovered 2.5/2.5'=100%. CLAYSTONE: Same as above; moist. 73.7-76.2'-Sample. Recovered 2.5/2.5'=100%. CLAYSTONE: Same as above; moist. 76.2-81.2'-Sample. Recovered 5.0/5.0'=100%. SANDSTONE: medium gray (N 5); clayey; fine-grained; well sorted; moist.			
Rema	80 Tks		Looped	l by: T. Gulliver & L. Pivonka		Checked by	Abl

Remarks

Logged by: T. Gulliver & L. Pivonka

Project No. 106P06222

Hydro-Search, Inc.

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Rocky Flats Plant

LOG OF BORING NO.

40-86

Date Drilled

9/23/86

Boring Method Casing Driver/NC Core

Coordinates N 36612.8 E 25398.1 Ground Surface Elevation 5941.23

Elev. [epth feet)	Semple Type	Graphic Log		Penetration Resistance (Blows/Inch	(%)	Other Tests
	85 99 95 95 95 95 95 95 95 95 95 95 95 95			81.2-83.7'-Sample. Recovered 2.5/2.5'=100\footnote{\text{SANDSTONE:}} Same as above; moist. 83.7-86.2'-Sample. Recovered 2.5/2.5'=100\footnote{\text{CLAYSTONE:}} dark gray (N 3); silty; some organic carbon plant fossils; moist. 86.2-88.0'-Sample. Recovered 1.8/1.8'=100\footnote{\text{CLAYSTONE:}} dark gray (N 3); silty; some organic carbon plant fossils; moist. 88.0-90.9'-Sample. Recovered 2.9/2.9'=100\footnote{\text{CLAYSTONE/SANDSTONE:}} dark gray (N 3) claystone and interbedded with 0.2 to 1.0" layers of fine grained sandstone; moist. 90.9-95.9'-Sample. Recovered 5.0/5.0'=100\footnote{\text{SANDSTONE:}} dark gray (N 3); fine-grained; some organic-rich interlaminae; trace of calcium carbonate; well sorted; moist to wet. 95.9-100.9'-Sample. Recovered 5.0/5.0'=100\footnote{\text{SANDSTONE:}} dark gray (N 3); fine-grained; some organic-rich interlaminae; well sorted; moist to wet.		20 40	
emarks			Logged	by: T. Gulliver & L. Pivonka		Checked by:	LUA
roject	No		Ĩ				77.47

106P06222

Hydro-Search, Inc.

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Rocky Flats Plant

LOG OF BORING NO.

Date Drilled

9/23/86

Casing Driver/NC Core

Coordinates N 36612.8

E 25398.1

106P06222

Hydro-Search, Inc.

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LOG OF BORING NO. Project: Rocky Flats Plant Coordinates N 36612.8 **Date Drilled** 9/23/86 E 25398.1 Boring Method **Ground Surface Elevation** Casing Driver/NC Core 5941.23 Penetration Resistance Other Depth Sample Graphic (feet) Type Log Elev. (feet) **Material Description** Tests (Blows/Inch) 20 40 120 120.4-123.2'-Sample. Recovered 2.8/2.8'=100%. SANDSTONE: medium gray (N 5); fine to mediumgrained; some thin coal seams; well sorted; wet. 123.2-124.8'-Sample. Recovered 1.5/1.5'=100%. CLAYSTONE: medium gray (N 5); silty; laminated; moist. TOTAL DEPTH: 125.0' 30 Remarks Checked by Logged by: T. Gulliver & L. Pivonka Project No. Hydro-Search, Inc. 106P06222 Page 7 of 7

WELL	40–86	

CONSULTING HYDROLOGISTS-GEOLOGISTS

WELL CONSTRUCTION SUMMARY ELEVATION: GROUND LEVEL _____5941.23 LOCATION or COORDS: __ TOP OF CASING _____5942.21' N 36612.8 E 25398.1 20 CONSTRUCTION TIME LOG: **DRILLING SUMMARY:** START FINISH TOTAL DEPTH Well: 111.50' Hole: 125.00' TASK BOREHOLE DIAMETER 0.00' - 52.00'; 5 5/8" DATE TIME DATE TIME 52.00' - 125.00': 4 3/4" 1986 1986 DRILLING: 5,5/" casing 9/23 0950 9/23 1335 DRILLER Boyles Brothers Drilling Co. Pivonka 40 10/3 1527 10/7 1530 15865 W. 5th Avenue NC core 10/4 1530 10/8 0935 Golden, CO (Jim Horn, Tom High) Reaming RIG 0.00'-52.00': casing advancer, 52.00'-_ Gulliver/L. GEOPHYS. LOGGING: 125.00'; Mobile B-57
BIT(S) 0.00'-52.00'; down hole hammer, 52.0 CASING: 2<u>" stainless</u> 10/8 1410 10/8 1413 -125.00': coring bit 60 5" steel 9/23 0950 9/23 1335 DRILLING FLUID _____None Ë SURFACE CASING 5" x 55.36' steel w/ lock-10/8 1413 10/8 1545 FILTER PLACEMENT 10/8 1554 10/8 1623 CEMENTING: PERSONNEL WELL DESIGN: 10/23 1310 10/23 1310 80 LEVELCPMENT: OTHER: BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG X 10/8 1545 10/8 1554 Bentonite CASING STRING(S): C=CASING S=SCREEN 10/8 1300 10/8 1346 0.00' 51.96' C1 0800 1515 10/7 10/7 Packer testing 0.00'- 87.98' C2 87.98'- 111.50' SI 100 WELL DEVELOPMENT See Well Development Summary Sheet. 120 CASING: CI 5" I.D. steel surface casing. c2 2" I.D. Sch. 5 type 316 stain-**Plant** less steel, threaded and flush jointed. Rocky Flats SCREEN: SI 2" I.D. Sch. 5 type 316 stain-140 · less steel, threaded and flush COMMENTS: jointed, 0.010" wire wrap screen, . 0.25' welded bottom cap. Water encountered at 91.0' during drilling. CENTRALIZERS Type 304 stainless steel 100.25' - 101.47' Top of stainless steel casing: 0.98' 160 PROJECT FILTER MATERIAL 32-42 silica sand 87.00' - 111.70' CEMENT Portland Type I 0.00' - 85.00' 180 OTHER 3/8" bentonite pellets 85.00' - 87.00' 111.70' - 125.00' 200 HYDRO-SEARCH RENO-DENVER

WELL40-86

WELL DEVELOPMENT SUMMARY

DATE	TIME	METHOD	VOLUME	APPEARANCE	COMMENTS
10-23-86	1310	_	-	_	<u>Dry</u>
			·		
					
		•			•
•					
	•				
				,	

PACKER TEST ANALYSIS WELL NO. 40-86

ROCKY FLATS PLANT JOB NO. 106P06222

DATE TESTED: 10/7/86 BY: L. PIVONKA

TEST INTERVAL (FEET BELOW G.S.): 63.00 - 73.03

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 91.00

K = ----- LN(--)

2(PI)(L)(H) R

1ST P1/3 TEST

Q = INJECTION RATE = .00031139 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 10.03 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 68.01 + 4.90 + 4.00 * 2.31 = 82.15

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000025 FT/MIN

K = .00000013 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00177354 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 10.03 FEET TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 68.01 + 4.90 + 13.00 * 2.31 = 102.94

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000113 FT/MIN

K = .00000057 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00047385 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 10.03 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 68.01 + 4.90 + 4.00 * 2.31 = 82.15

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000038 FT/MIN

K = .00000019 CM/SEC

```
PACKER TEST ANALYSIS
              WELL NO. 40-86
    ROCKY FLATS PLANT JOB NO. 106P06222
      DATE TESTED: 10/7/86 BY: L. PIVONKA
TEST INTERVAL (FEET BELOW G.S.): 92,00 ~ 102.03
  MATERIAL TESTED: ARAFAHOE SANDSTONE
  DEPTH TO WATER (FEET BELOW G.S.): 91.00
       K = ----- LN(--)
            2(PI)(L)(H) R
1ST F1/3 TEST
           \Omega = INJECTION RATE = .00036554 (FEET3/MIN)
           L = LENGTH OF TEST INTERVAL = 10.03 FEET
           TEST INTERVAL IS BELOW WATER TABLE
           HEAD = DEPTH TO WATER + GAGE HEIGHT
                   + GAGE PRESSURE (IN FEET)
                   = 91.00 + 4.90 + 4.00 * 2.31 = 105.14
           R = BOREHOLE RADIUS = .16 FEET
          K = HYDRAULIC CONDUCTIVITY = .00000023 FT/MIN
                                       K = .00000012 \text{ CM/SEC}
P2/3 TEST
           Q = INJECTION RATE = .00121847 (FEET3/MIN)
           L = LENGTH OF TEST INTERVAL = 10.03 FEET
           TEST INTERVAL IS BELOW WATER TABLE
           HEAD = DEPTH TO WATER + GAGE HEIGHT
                   + GAGE PRESSURE (IN FEET)
                   = 91.00 + 4.90 + 21.00 * 2.31 = 144.41
           R = BOREHOLE RADIUS = .16 FEET
           K = HYDRAULIC CONDUCTIVITY = .00000055 FT/MIN
                                        K = .00000028 \text{ CM/SEC}
2ND P1/3 TEST
           Q = INJECTION RATE = .00016246 (FEET3/MIN)
           L = LENGTH OF TEST INTERVAL = 10.03 FEET
           TEST INTERVAL IS BELOW WATER TABLE
           HEAD = DEPTH TO WATER + GAGE HEIGHT
```

= 91.00 + 4.90 + 4.00 * 2.31 = 105.14

+ GAGE PRESSURE (IN FEET)

```
PACKER TEST ANALYSIS WELL NO. 40-86
```

ROCKY FLATS PLANT JOB NO. 106P06222

DATE TESTED: 10/7/86 BY: L. PIVONKA

TEST INTERVAL (FEET BELOW G.S.): 102.00 - 112.03

MATERIAL TESTED: ARAPAHOE SANDSTONE

DEPTH TO WATER (FEET BELOW G.S.): 91.00

Q L K = ----- LN(--) 2(PI)(L)(H) R

1ST P1/3 TEST

Q = INJECTION RATE = .00028431 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 10.03 FEET TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 91.00 + 4.90 + 4.00 * 2.31 = 105.14

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .000000018 FT/MIN<math>K = .000000009 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00116431 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 10.03 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 91.00 + 4.90 + 17.00 * 2.31 = 135.17

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000056 FT/MIN

K = .00000029 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00040616 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 10.03 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 91.00 + 4.90 + 4.00 * 2.31 = 105.14

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000025 FT/MIN
K = .00000013 CM/SEC

PACKER TEST ANALYSIS

WELL NO. 40-86

ROCKY FLATS PLANT JOB NO. 106P06222

DATE TESTED: 10/7/86 BY: L. PIVONKA
TEST INTERVAL (FEET BELOW G.S.): 113.00 - 123.03

MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 91.00

Q L

K = ----- LN(--)2(PI)(L)(H) R

1ST P1/3 TEST

Q = INJECTION RATE = .00124554 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 10.03 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)

= 91.00 + 4.90 + 3.50 * 2.31 = 103.99 R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000078 FT/MIN
K = .00000040 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .01506158 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 10.03 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 91.00 + 4.90 + 25.00 * 2.31 = 153.65
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000642 FT/MIN
K = .00000326 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00120493 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 10.03 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 91.00 + 4.90 + 2.31 =

= 91.00 + 4.90 + 4.00 * 2.31 = 105.14 R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000075 FT/MIN
K = .00000038 CM/SEC

Water Level Data for Rockwell (Rocky Flats)

Date Measured	Depth to Water from TOC	Elevation TOC (ft)	Water Level Elev. (ft)
** Well Number	: 4086		
10/23/86	-1.00	5942.21	
11. 26/86	105.75	5942.21	5836.46
01/01/87	95.23	5942.21	5846.98
02/01/87	92.13	5942.21	5850.08
05/06/87	85.63	5942.21	5856. 58
06/01/87	102.60	5942.21	5839.61
07/07/87	103.45	5942.21	5838.76
07:20/87	101.10	5942.21	5841.11
08/06/87	104.30	5942.21	5837.91
09/01/87	100.30	5942.21	5841.91
10/22/87	93.80	5942.21	5848.41
11/02/87	108.40	5942.21	5833.81
12/01/87	103.30	5942.21	5838.91

INDEX OF DATA

Boring	No.: 41-86
Comple	ted as well? Yes
Data in	File
X_	Log of Borehole
<u>X</u>	Well Construction Summaries
<u> </u>	Well Development Summaries
X_	Hydraulic Conductivity Test Data
	and Results
<u> </u>	Packer Test Data and Results
X	Water Level Data

Rocky Flats Plant

LOG OF BORING NO.

41-86

Date Drilled 8/16/86 - 8/18/86

Boring Method Hollow Stem Auger

Coordinates N 36611.4

E 25437.1

Ground Surface Elevation 5940.03

Elev. (feet)	Depth (feet)	Semple Graph Type Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	Content	Other Tests
	0	1 32	ROCKY FLATS ALLUVIUM	1111		
	_		0-2.0'-Sample. Recovered 1.8/2.0'=90%.	· -	-	
	-		0-0.3'. GRAVEL: moderate		_	
			brown (5YR 3/4); granitic pebbles and cobbles;			
	_		unconsolidated; dry.		-	
			0.3-1.5'. CLAY: moderate	·	_	
	2.5		reddish brown (10R 4/6); trace granitic pebbles and			
			cobbles; silty; poorly sorted; unconsolidated;]	
			damp.			
	4		2.0-4.0'-Sample. Recovered 2.0/2.0'=100%.		-	
	-		CLAY: moderate reddish brown (10R 4/6); trace			
			granitic pebbles and cobbles; caliche			
			stringers; poorly sorted; unconsolidated; damp.		_	
	-		4.0-6.0'-Sample.		-	
			Recovered 2.0/2.0'=100%.		-	
	5 —		SAND: moderate reddish brown (10R 4/6); clayey;			·
	コ		very fine-grained; trace quartzite cobbles; poorly		_	
	_		sorted; subangular to subrounded; unconsoli-	İ	_	
		ن با	dated: wet.		-	
	1	ن في المراد	6.0-8.0'-Sample. Recovered 1.8/2.0'=90%.			
	J		GRAVEL: dark yellowish			
	_		quartzite pebbles and cobbles; poorly sorted;			
ŀ	4	1/1000	subangular; unconsoli-		-	
ŀ	7.5		dated; damp.	}		
. [ユ	00.0	9			
ļ	1	600			4	
	4		8.0-10.0'-Sample. Recovered 1.6/2.0'=80%.		-	
	1	000	GRAVEL: moderate yellowish brown (10R 4/6);			
ļ	J	000	20% cobbles > 1/2" in			
	4		diameter; sandy and clayey matrix; iron staining;		_	
	10	100	ungangalidatada dama	1,,,,1	,,,,,-	
Remai	rks		C. Walker		Checked by:	MP

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Hydro-Search, Inc.

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Rocky Flats Plant

LOG OF BORING NO.

Date Drilled 8/16/86 - 8/18/86

Coordinates N 36611.4

E 25437.1 5940.03

Date Drilled 8/16/86 - 8/18/86 Coordinates N 36611.4 E 25437.1 Boring Method Hollow Stem Auger Ground Surface Elevation 5940.03						
Elev. Depth Sample Graph (feet) Type Log		Penetration Resistance (Blows/Inch) 20 40	င်စ်ပြုံစိုင်္ဂ 20 40	Other Tests		
10	10.0-12.0'-Sample. Recovered 1.9/2.0'=90%. GRAVEL: dark yellowish orange (10YR 6/6); granite and quartzite pebbles; caliche stringers; iron staining; poorly sorted; unconsolidated; damp. 12.0-14.0'-Sample. Recovered 1.4/2.0'=70%. CLAY: moderate reddish brown (10R 4/6); trace quartzite pebbles; sandy; caliche stringers; poorly sorted; unconsolidated;					
—15—	sorted; unconsolidated; damp. 14.0-16.0'-Sample. Recovered 1.8/2.0'=90%. SAND: moderate reddish brown (10R 4/6); granitic; fine- to coarse-grained; poorly sorted; angular; unconsolidated; damp.					
17.5	16.0-18.0'-Sample. Recovered 2.0/2.0'=100%. SAND: moderate reddish brown (10R 4/6); fine to coarse grained; some granitic pebbles and cobbles; poorly sorted; angular; unconsolidated; damp.					
- 0.00.00.00.00.00.00.00.00.00.00.00.00.0	18.0-20.0'-Sample. Recovered 2.0/2.0'=100%. GRAVEL: moderate reddish brown (10R 4/6); 50-70% granite and quartzite pebbles; clay and sand matrix; poorly sorted; unconsolidated; damp.					
Remarks Logged by	: C. Walker		Checked by:	144 A		
Project No. 106P06222	Hydro-Search,	Inc.	Page 2 of 5	,		

Rocky Flats Plant

LOG OF BORING NO.

Date Drilled 8/16/86 - 8/18/86

Boring Method Hollow Stem Auger Coordinates N 36611.4 Ground Surface Elevation 5940.03

Elev.	Depth	Semple	Graphic	Material Description	Penetration Resistance (Blows/inch)	င်လိုနိုင်စိုင်း	Other Tests
(feet)	(feet)	Type	Log		20 40	20 40	
	20	//	3°00°				
			000	20.0-22.0'-Sample.			
			000	Recovered 2.0/2.0'=100%. GRAVEL: moderate reddish			
			ನಿಂಸಿ	brown (10R 4/6); 50-70%		_	
				granite and quartzite pebbles; clay and sand		_	
			ؿ؞ ڞ	<pre>matrix; iron staining;</pre>		_	
			50.0	<pre>caliche stringers; poorly sorted, unconsolidated;</pre>		_	
	_		000	damp.			
			7000	22.0-24.0'-Sample.			
			000	Recovered 2.0/2.0'=100%. GRAVEL: moderate reddish		-	
	22.5		200	brown (10R 4/6); clay and		_	
	1			sand matrix; 50-70% pebbles; some schists and			
			2000	quartzite; sandstone;		_	
				unsorted; damp.		_	
			0.00	24.0-26.0'-Sample.		_	
	-		200	Recovered 2.0/2.0'=100%. GRAVEL: moderate reddish			
			D.0<	brown (10R 4/6); clay and		_	
			70.00	sand matrix; 50-70% pebbles; some schists and			
			000	quartzite; sandstone;		_	
			Do	unsorted; sandy lenses at 24.3-24.5' 2" thick; damp.			
	25		0000	26 0-28 01-62mmle			
			75°8	26.0-28.0'-Sample. Recovered 1.9/2.0'=95%.		_	
			000	GRAVEL: light brown (5YR 5/6); some quartzite		-	
			.0.2	cobbles; dark yellowish			
			1003	orange (10YR 6/6) limonite; poorly sorted;		_	
			200	angular; unconsolidated;		_	
			000	damp.		_	
	_	V/				_	
			:000	28.0-28.5'-Sample. Recovered 0.0/0.5'=0%.		· _	
	27.5	V/	000	·			
			1,000	28.5-30.0'-Sample. Recovered 1.5/1.5'=100%.		_	
			0:00	GRAVEL: moderate yellowish brown (10YR		_	
			0000	5/4); quartzite pebbles		_	
	-		\bigcirc	and cobbles; sandy clay matrix; poorly sorted;		-	
	"		000	unconsolidated; damp.		_	
	I –		000			-	
	_		ેં			_	
	_					_	
	30						
Rema	arks	Log	ged by:	C. Walker		Checked by:	

Project No.

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Hydro-Search, Inc.

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Rocky Flats Plant

LOG OF BORING NO.

41-86

Date Drilled 8/16/86 - 8/18/86

Boring Method Hollow Stem Auger

Coordinates N 36611.4 E 2543

Ground Surface Elevation 5940.03

Elev. (feet)	Depth (feet)	Semple Type	Log		Penetration Resistance (Blows/Inch) 20 40		Other Tests
	30		0000	30.0-31.5'-Sample.			
			0.0	Recovered 0.8/1.5'=53%. GRAVEL: Same as above;			
			0.0.	damp.			
			000	31.5-31.8'-Sample.			
	_		· · · · O	Recovered 0.0/0.3'=0\. 31.8-32.2'-Sample.		-	
	-		O , \Box °	Recovered 0.0/0.4'=0%.		_	
	_		30	AA A AA E A		_	
			0.000	/Recovered 0.3/0.3'=100%. SAND: moderate brown (5YR)			
1			0.00	/ 4/4); quartzose sand;			
			,0,0	fine-grained; gravelly;			
				<pre>poorly sorted; subangular to subrounded;</pre>		٦	
	32.5		v 0 0	unconsolidated; damp.		-	
	-		0000	32.5-33.3'-Sample.		· -	
	_	// }	200	Recovered 0.9/0.8'=113%. GRAVEL: pale orange		-	
		/ /}	0.0	yellow (10YR 5/6) to light		_	
		//	2000	brown (5YR 5/6); 30%		_	
	7		000	granite pebbles and cobbles with very coarse			
ŀ	7		0.00	to fine-grained sand;		٦	
I			$\supset \bullet \cdot \mathcal{O}$	poorly sorted;		-	
			0.0	unconsolidated; damp.		-	
	-	// [0000	33.3-35.0'-Sample.		4	
	L L			Recovered 2.0/1.7'=118%.		_	
		//E	. 17.	GRAVEL: Same as above;			
F	35			damp. 35.0-37.0'-Sample.		7	
l	7			Recovered 1.7/2.0'=85%.		7	
1				SAND: moderate brown (5YR		4	
1		//		4/4); clay matrix; some quartzite cobbles (<20%);			
1				iron staining in sands at			
	1			37.0'; becomes more		∇ \dashv	
				<pre>cobbley with depth; poorly sorted; unconsolidated;</pre>			
				damp.		Y	
	7			37.0-38.5'-Sample.			
				Recovered 1.5/1.5'=100%. SAND: Same as above;		7	
ł				damp.		4	
-	_37.5_			38.5-40.0'-Sample. Recovered 1.5/1.5'=100%.	ľ	4	
	1∕			Recovered 1.5/1.5 = 100%.		- 4	
	→			38.5-39.6'. GRAVEL:		4	1
	→		· · · · · ·	<pre>moderate brown (5YR 4/4); granitic pebbles and</pre>		ال	1
i i	し	/ /E	0.0.2	cobbles and clayey sand;			
	7	//b	2000	poorly sorted; angular;		7	
	1	//[100	unconsolidated; wet. /39.6-40.0'. SAND:		4	•
		/ 1	0.4	/yellowish gray (5Y 7/2) to		-	•
1	4		0°0°	/ light olive gray (5Y 5/2);	ı	-4	1
i	→	//[.	00.0	<pre>fine-grained; clayey; trace coarse-grained sand;</pre>	1	4	
	1		ا دود	moderately sorted;		ال	
	40			unconsolidated; damp.			
Remar	ks	Logge	d by: (C. Walker		Checked by:	AP

Project No.

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Hydro-Search, Inc.

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LOG OF BORING NO. Project: Rocky Flats Plant Coordinates N 36611.4 E 25437.1 Date Drilled 8/16/86 - 8/18/86 Boring Method Ground Surface Elevation 5940.03 Hollow Stem Auger Penetration Resistance Other Tests Depth Sample Graphic (feet) Type Log Elev. (feet) Material Description (Blows/Inch) 20 40 40.0-41.2'-Sample. Recovered 1.2/1.2'=100%. SAND: Same as above; wet. 41.2-41.7'-Sample. Recovered 0.0/0.5'=0%. 200 41.7-43.0'-Sample. Recovered 1.2/1.3'=92%. GRAVEL: moderate 0.00 yellowish brown (10YR 5/4); granite and quartzite pebbles; clayey sand matrix; dark yellowish orange (10YR 6/6) iron staining; poorly sorted; unconsolidated; 43.0-44.8'-Sample. Recovered 1.4/1.5'=93%. 0 43.0-44.0'. GRAVEL: light brown (5YR 5/6) to moderate brown (5YR 4/4); granitic pebbles and cobbles; sandy clay matrix; poorly sorted; subangular; unconsolidated; wet. 44.0-44.4'. SAND: moderate reddish orange (10R 6/6); quartz and feldspar sand; fine to coarse-grained; trace granitic pebbles and cobbles; poorly sorted; unconsolidated; wet. ARAPAHOE FORMATION 44.0-44.8'. CLAYSTONE: yellowish gray (5Y 7/2); silty; black organic flakes; poorly consolidated; wet. TOTAL DEPTH: 44.8' 50 Remarks Logged by: C. Walker Checked by: Project No.

Hydro-Search, Inc.

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WFI	•	41-86
	2	7,00

					WELL CONSTR	RUCTION 3	OIVIIV	IAN		
	ĺ				LOCATION or COORDS:	ELEVATION: GROUP	ND LEVE	59	40.03'	
	ı	## ##		棚き	N 36611.4 E 25437.1	TOP O	F CASIN	G 59	41.83'	
			ΙĒ			T				
			∄≣		DRILLING SUMMARY:	CONSTRUCTION			1 514	160
			∄	. .	TOTAL DEPTH Well: 44.70' Hole: 45.06'	TASK	_	ART I		ISH I
			I	b	BOREHOLE DIAMETER		<u>DATE</u> 1986	TIME	<u>DATE</u> 1986	TIM
	$\prod_{i=1}^{n}$			C	DRILLER Boyles Brothers Drilling Co.	DRILLING: 건남" auger	8/16	1701	_8/18	1745
		0		k	15865 W. 5th Avenue	75" casing ad		1045	8/19	1207
			≣	300	Golden, CO (Tony Robinson)	vancer				
			∄		RIG Acker	GEOPHYS. LOGGING:				
8 ;			≣	=	BIT(S) Blade bit	CASING:				
1 9	-	15	ΙĒ		N.	2" stainless	8/19	_1410_	8/19	_1420
Colden,			I		DRILLING FLUID None					
9 0			≣		SURFACE CASING 5" x 4' steel w/ locking	FILTER PLACEMENT	8/19	1420	8/19	1815
	!]		I	880	cap	CEMENTING:	8/19	1820	8/19	1825
LOCATION		20	I	C	WELL DESIGN:	LEVELCPMENT:	9/23	_1320_	9/25	1650
LOCATION		Ŭ	▮≣	0	BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG	OTHER:	0/10	1015	8/10	1020
			I≣	É	CASING STRING(S): C=CASING S=SCREEN	<u>Bentonite</u>	8/19	1815	8/19	1820
			I		0.00' 3.90' C1					
	1.		∄	C						
	Γ'	25		0						
	Ш			0.0.0°		WELL DEVELOF	MENT		<u></u>	
				0		WEEL PETEG.				
	╽╽			18		See Well Develo	nment (i mmarv	Sheet	
		XO.	Ī	2.	CASING: C1_2" I.D. Sch. 5 type 316 stain-	See Well Develo	PARETTE C	Addition y	oriect.	
				lo.	less steel, threaded and flush					
ant l				50	jointed.					
P P			≣	2						
5222 Flats	1-3	35	I	0	SCREEN: SI 2" I.D. Sch. 5 type 316 stain- less steel, threaded and flush					
106P06222 Rocky F1a			I		jointed, 0.010" wire wrap screen	COMMENTS:				
106PQ					0.25' welded bottom cap.	Water encounter	ed at	36.7' du	ring dri	lling
					CENTRALIZERS None (see comments)					
	-4	d		PG		Top of stainles	s steel	casing	: 1.80'	
PROJECT				β.	FILTER MATERIAL 32-42 silica sand	Cave from TD to	44.70			
S S			[≣	ø	2.79' - 44.70'					
•	'				CEMENT Portland Type I	Well built thro		sing adv	ancer; r	<u> </u>
	45	;		-	0.00' - 2.00'	<u>centralizers us</u>	sed.			
					OTHER 3/8" bentonite pellets 2.00' - 2.79'					
					2.00					
	_50)						***		
	<u> </u>				HYDRO-SEARCH RENO-DENVER	CONSULTING HY	DROLO	GISTS.	-GEOLO	GIST

106P06222

WELL DEVELOPMENT SUMMARY

DATE	TIME	METHOD	VOLUME	APPEARANCE	COMMENTS
9-23-86	1320		_		<pre>1 Well Bore Volume = 2.24 gals. 10 Well Bore Volumes = 22.4 gals.</pre>
9-23-86	1615	Bailed	7 gals.	Medium to light brown, turbid	Pump stuck at 30' down hole 7/22.4 gals. purged to date
9-24-86	0830	Airlifted		Brown spray	Lifted large amount of sand
9-24-86	1615	Bailed	15.5 gals.	Medium brown, turbid, then clear	Last 3 gals. bailed were clear 22.5/22.4 gals. purged to date
9-25-86	1650	Bailed		Light brown to clear	Sampled
	-				
	-	,			
·					
			` <u> </u>		
		H. W.			
					·

AQUIFER TEST DATA

WELL 41-86

Type of Aquifer Test:

Bail down - Recovery

How Q Measured: 4.5 gallon bucket

How W.L.'s Measured: Olympic Well Sounder

Measuring Point for W.L.'s: Top of Casing

Elevation of Measuring Point: 5943.12'

Depth of pump/airline: N/A

Start bailing: Stop bailing:

930.00 Time: Time: 945.16

Duration of Aquifer Test:

4362.2 min.

TIME

WATER LEVEL DATA

COMMENTS

Stop bailing (bailed 2 gallons)

t = 15.16 min. at t' = 0

Static Water Level: 24.91'

Project No.: 106P06222

-Location: Rocky Flats Plant

Personnel: J. Pearce, M. Bergman

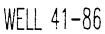
ŧ' t Water Draw-Level down Begin bailing

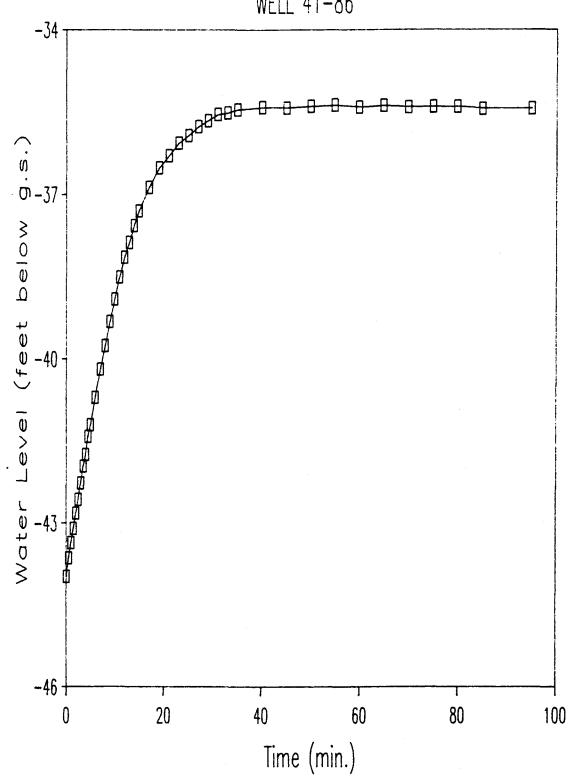
0				
15.2	0	43.98	19.07	
15.7	.5	43.64	18.73	
16.2	1.0	43.36	18.45	
16.7	1.5	43.10	18.19	
17.2	2.0	42.82	17.91	
17.7	2.5	42.57	17.66	
18.2	3.0	42.27	17.36	
18.7	3.5	41.96	17.05	
19.2	4.0	41.75	16.84	
19.7	4.5	41.42	16.51	
20.2	5.0	41.21	16.30	
21.2	6.0	40.71	15.80	
22.2	7.0	40.19	15.28	
23.2	8.0	39.76	14.85	
24.2	9.0	39.32	14.41	
25.2	10.0	38.91	14.00	
26.2	11.0	38.51	13.60	
27.2	12.0	38.15	13.24	
28.2	13.0	37.98	12.97	
29.2	14.0	37.57	12.66	
30.2	15.0	37.30	12.39	
32.2	17.0	36.87	11.96	
34.2	19.0	36.51	11.60	
36.2	21.0	36.29	11.38	
38.2	23.0	36.06	11.15	
40.2	25.0	35.92	11.01	
42.2	27.0	35 <i>.</i> 76	10.85	
44.2	29.0	35.65	10.74	
46.2	31.0	35.54	10.63	
48.2	33.0	35.51	10.60	
50.2	35.0	35.45	10.54	
55.2	40.0	35.41	10.50	
		45		

60.2	45.0	35.42	10.51
65.2	50.0	35.39	10.48
70.2	55.0	35.37	10.46
75.2	60.0	35.41	10.50
80.2	65.0	35.38	10.47
85.2	70.0	35.41	10.50
90.2	75.0	35.40	10.49
95.2	80.0	35.40	10.49
100.2	85.0	35.44	10.53
110.2	95.0	35.43	10.52
120.2	105.0	35.41	10.50
130.2	115.0	35.42	10.51
140.2	125.0	35,43	10.52
150.2	135.0	35.44	10.53
160.2	145.0	35.44	10.53
170.2	155.0	35.44	10.53
180.2	165.0	35.44	10.53
190.2	175.0	35.44	10.53
200.2	185.0	35.42	10.51
215.2	200.0	35.40	10.49
230.2	215.0	35.39	10.48
245.2	230.0	35.41	10.50
260.2	245.0	35.41	10.50
275.2	260.0	35.39	10.48
290.2	275.0	35.40	10.49
305.2	290.0	35.39	10.48
320.2	305.0	35.37	10.46
335.2	320.0	35.40	10.49
350.2	335.0	35.38	10.47
380.2	365.0	35.40	10.49
1400.2	1385.0	35.72	10.81
1880.2	1865.0	35.48	10.57
2870.2	2855.0	35.49	10.58
3429.2	3414.0	35.59	10.68
4362.2	4347.0	35.63	10.72

90% recovery at 26.81'. (only recovered 70%)

AQUIFER TEST DATA





Water Level Data for Rockwell (Rocky Flats)

Date Measured	Depth to Water from TOC	Elevation TOC (ft)	Elev. (ft)
** Well Numbe	er: 4186		
09/23/86	27.28	5941.83	5914.55
09/25/86	37.02	5941.83	5904.81
09/30/86	27.03	5941.83	5914.80
10/13/86	38.38	5941.83	5903.45
11/26/86	33.56	5941.83	5908.27
01/01/87	31.88	5941.83	5909.95
02/01/87	30.13	5941.83	5911.70
05/06/87	34.27	5941.83	5907.56
06/01/87	34.30	5941.83	5907.53
07/08/87	35.80	5941.83	5906.03
07/20/87	36.30	5941.83	5905.53
08/06/87	36.60	5941.83	5905.23
09/01/87	36.70	5941.83	5905.13
10/22/87	37.20	5941.83	5904.63
11/02/87	37.40	5941.83	5904.43
12/01/87	38.24	5941.83	5903.5 9

INDEX OF DATA

Boring	No.: 42-86
Comple	ted as well? Yes
Data in	File
<u> </u>	Log of Borehole
<u> </u>	Well Construction Summaries
<u> </u>	Well Development Summaries
	Hydraulic Conductivity Test Data
	and Results
	Packer Test Data and Results
X	Water Level Data

Project: Rocky Flats Plant

LOG OF BORING NO.

42-86

Date Drilled 9/12/86, 9/13/86

N 36565.8

E 24007.9

Boring Method Hollow Stem Auger

Ground Surface Elevation 5954.34

Boring Method Hollo	Boring Method Hollow Stem Auger Ground Surface Elevation 5954.34					
Elev. Depth Sample Grap (feet) (feet) Type Loo	_ 1	Penetration Resistance (Blows/Inch) 20 40	Content 20 40	Other Tests		
	0-2.0'-Sample. Recovered 0.5/2.0'=25.%. GRAVEL: medium bluish gray (5B 5/1); granite and quartzite pebbles and cobbles; some clay; caliche stringers; poorly sorted; unconsolidated; dry. 2.5'-Cuttings. GRAVEL: Same as above; dry. 2.0-3.3'-Sample. Recovered 1.0/2.0'=50%. GRAVEL: medium gray (N 5); granite and quartzite pebbles and cobbles; coarse sand matrix; poorly sorted; subangular; unconsolidated; dry. 3.3-5.0'-Sample. Recovered 1.7/1.8'=94%. GRAVEL: Same as above; dry. 5.0-6.5'-Sample. Recovered 1.5/1.5'=100%. GRAVEL: Same as above; dry. 6.5-8.0'-Sample.					
Remarks Logged by	: C. Walker		Checked by:	NA		
Project No.	· O. MATINET		Glecked by:	A-RA		
106P06222	Hydro-Search,	Inc.	Page 1 of 4			

Project:

Rocky Flats Plant

LOG OF BORING NO.

Date Drilled 9/12/86, 9/13/86

Boring Method Hollow Stem Auger

Coordinates N 36565.8 E 24007.9

Ground Surface Elevation 5954.34 Penetration Resistance Other Depth Sample Graphic (feet) Type Log Tests Elev. **Material Description** (Blows/Inch) feet 20 40 10 11.5-13.0'-Split Spoon. Recovered 1.0/1.5'=67%. GRAVEL: grayish orange pink (5YR 7/2) to moderate brown (5YR 4/4); granitic pebbles and cobbles in sand matrix; poorly sorted; angular to subangular; unconsolidated; dry. 13.0-14.0'-Sample. Recovered 0.9/1.0'=90%. GRAVEL: grayish orange pink (5YR 7/2) to moderate brown (5YR 4/4); Same as above; dry. 14.0-16.0'-Sample. Recovered 2.0/2.0'=100%. GRAVEL: Same as above; dry. 16.0-16.5'-Sample. Recovered 0.5/0.5'=100%. GRAVEL: moderate reddish brown (10R 6/6); granitic pebbles and cobbles in sand matrix; poorly sorted; subangular to angular; unconsolidated; 0 0 dry. O, 17.5-18.5'-Sample. Recovered 1.0/1.0'=100%. GRAVEL: moderate reddish brown (10R 6/6); granite 00 and quartzite pebbles in sand matrix; poorly sorted; subrounded to subangular; unconsolidated; dry. 18.5-20.0'-Sample.

Remarks

Logged by: C. Walker

augers.

Checked by:

Project No.

20

106P06222

Hydro-Search, Inc.

Recovered 0.0/1.5'=0%. Drilled with center bit in

Page 2 of 4

Project: Rocky Flats Plant

LOG OF BORING NO.

Date Drilled 9/12/86, 9/13/86

Boring Method Hollow Stem Auger

N 36565.8

E 24007.9

Ground Surface Elevation 5954.34

Borning metriod (DIT	ow Stem Auger Ground St		رسود موسود والمساعور	
Elev. Depth Samus Grad (feet) Type Lo		Penetration Resistance (Blows/Inch) 20 40		Other Tests
22.5.1 00.00	Recovered 1.3/1.3'=100%. GRAVEL: moderate brown (5YR 3/4) granitic pebbles and cobbles in sand matrix; trace clay; poorly sorted; subangular; unconsolidated; wet. 21.3-23.0'-Sample. Recovered 2.0/1.7'=118%. SAND: moderate brown (5YR 4/4); clayey; <10% granitic pebbles and cobbles; poorly sorted; subrounded to subangular; unconsolidated; wet. 23.0-25.0'-Sample. Recovered 1.3/2.0'=65%. GRAVEL: moderate yellowish brown (10YR 5/4); granitic pebbles; clayey sand matrix; poorly sorted; unconsolidated; wet. 25.0-27.0'-Sample. Recovered 0.0/2.0'=0%. 27.0-29.0'-Sample. Recovered 0.8/2.0'=40%. 27.0-28.6'. GRAVEL: moderate yellowish brown (10YR 5/4); granitic pebbles and coarse-grained sand (50%); poorly sorted; unconsolidated; wet.		<u> </u>	
30	ARAPAHOE FORMATION 28.6-29.0'. SANDSTONE: yellowish gray (5Y 7/2); fine-grained; quartzose; well sorted; well rounded; moderately well cemented; damp.			
Remarks Logged by: C. Walker Checked by:				
Project No. 106P06222 Hydro-Search, Inc. Page 3 of 4				

Project: Rocky Flats Plant

Project No.

106P06222

LOG OF BORING NO.

42-86

Date Drilled 9/12/86, 9/13/86

Boring Method Hollow Stem Auger

N 36565.8

E 24007.9

Page 4 of 4

Ground Surface Elevation

5954.34

Bor	ing Method	HOTTOM	Stem Auger Ground Su	LIECO EIGATO	On 3934.34	
Elev. (feet)	Depth Sample (feet) Type	Graphic Lóg	Material Description	Penetration Resistance (Blows/Inch) 20 40	Containt 20 40	Other Tests
	30		29.0-31.0'-Sample. Recovered 2.0/2.0'=100%. CLAYSTONE: pale olive (10Y 6/2) to light olive brown (5Y 5/6); silty; pale yellowish orange (10YR 8/6) stringers; some organic fragments; poorly consolidated; damp. 31.0-33.0'-Sample. Recovered 1.2/2.0'=60%. CLAYSTONE: Same as above. Grades downward into sandstone; very fine-grained; well sorted; poorly consolidated; damp. 33.0-35.0'. Lost core.			
	35		TOTAL DEPTH: 35.0'			
Rema	rks Logg	ged by:	C. Walker		Checked by:	

Hydro-Search, Inc.

WEL	42-86	

			6	2	•	· V	ELL_	42-86		
		-0			WELL CONSTR					
						-			5% 2%1	
				0	LOCATION or COORDS:	ELEVATION: GROU	ND LEVEI OF CASIN	<u>در</u> 59	56.43	
			250344	200	N 30303.0 E 24007.3	1000	T CASIN	·		
	1 1	-5		O	DRILLING SUMMARY:	CONSTRUCTION	TIME	LQG:		
			∭≣		TOTAL DEPTH Well: 29.70' Hole: 35.00'	_	্ৰ হা	ART	FIN	ISH
				Σ.	BOREHOLE DIAMETER 75"	TASK	DATE 1986	TIME	<u>DATE</u> 1986	TIME
						DRILLING:	i .			
		10	∭≣	K	DRILLER Boyles Brothers Drilling Co.	7½" auger	9/13	0805	9/15	1420
			∭≣	र्व	15865 W. 5th Avenue Golden, CO (Tony Robinson)	7설" casing ad- vancer	9/15	1720	9/15	1815
			∭≣	1	RIG Acker	GEOPHYS. LOGGING:				
			▓≣	30	BIT(S) Blade bit	CASING:				
8	ä	_15	▓≣	8	611(5)	2" stainless	9/16	1025	9/15	1030
Golden,	Walker		∭≣	So.	DRILLING FLUID None					
9	3		▓≣	ntas Sie me Kom		-				
			▓≣	P	SURFACE CASING 5" x 4' steel w/ locking cap	FILTER PLACEMENT:	9/16 9/16	<u>1030</u> 1245	9/16 9/16	1240 1310
_	ᇤ		▓≣	0.00	WELL DESIGN:	CEMENTING:	9/22	1100	9/24	1510
<u>S</u>	NNO	-20		6	BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG	CEVELCPMENT: OTHER:				
LOCATION	PERSONNEL		▓≣		CASING STRING(S): C= CASING S=SCREEN	Bentonite	9/16	1240	9/16	1245
ت	ā		∭≣		0.00' 6.12' C1					
			∭≣	0:0.	6.12' - 29.70' S1	4				
		-25		0						
I	ı		∭≣	Þχ						
	1					WELL DEVELOP	MENT			
	- 1		∭≣	20						
		_30				See Well Develo	opment S	Summary	Sheet.	
- (- 1			ဓ	CASING: CI 2" I.D. Sch. 5 type 316 stain-				,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	
	님			莒	<u>less steel, threaded and flush</u> jointed.					
	Plant				onited.					
7	ats	-35			SCREEN: SI 2" I.D. Sch. 5 type 316 stain-					
106P06222	Rocky Flats	33			less steel, threaded and flush	COMMENTS:				
8	됬			- 1 1	jointed, 0.010" wire wrap screen			10 01 1		'11 <i>'</i>
	2				0.25' welded bottom cap.	Water encounter	red at	19.0 CL	ring ar	LILING
1		40			CENTRALIZERS	Top of stainles	ss stee	casing	: 2.09	
<u> </u>		40								
PROJECT					FILTER MATERIAL 32-42 silica sand	Cave from TD to	29.70			
PRO					4.00' - 29.70'					
_	-	, ,			CEMENT Portland Type I 0.00' - 2.90'	Well built throused.	ough cas	ing; no	centra	ızers
		. 45			OTHER 3/8" bentonite pellets					
					2.90' - 4.00'					
						-				
		_50		[HYDRO-SFARCH REMOMBERATURE	CONSULTING H	יומפטו ר	GISTS.	GEOL O	GISTS

106P06222

WELL DEVELOPMENT SUMMARY

DATE	TIME	METHOD	VOLUME	APPEARANCE	COMMENTS
9-22-86	1100				<pre>1 Well Bore Volume = .84 gals. 10 Well Bore Volumes = 8.4 gals.</pre>
9-22-86	1100	Bailed	9 gals.	Medium to dark tan	2 liters fine sand removed 9/8.4 gals. purged to date
9-22-86	1630	Airlifted		Medium to dark brown	Cleared sand from well
9-23-86	0910	Bailed	80 gals.	Medium to dark tan to brown	89/8.4 gals. purged to date
9-24-86	1510	Bailed	20 gals.	Light brown	109/8.4 gals. purged to date
9-26-86	1350	Bailed		Light brown to very light tan	Sampled
·					
	·				

PROGRAM SLUGT, VERSION 4,0CT. 1985

THIS PROGRAM CALCULATES MEAN TRANSMISSIVITIES FROM SLUG-TEST DATA BASED ON TWO ANALYTICAL APPROACHES:

- (1) METHOD OF COOPER, BREDEHOEFT AND PAPADOPULOS, 1967 (ARTICLE IN VOL.3,NO.1 OF WRR ENTITLED
 - "RESPONSE OF A FINITE DIAMETER WELL TO AN INSTANTAMEOUS CHARGE OF WATER")
- (2) METHOD OF BOUNER AND RICE, 1976 (ARTICLE IN VOL. 12, NO.3 OF WAR ENTITLED "A SLUG TEST FOR DETERMINING HYDRAULIC COMPUCTIVITY OF UNCONFINED AGUIFERS WITH COMPLETELY OR PARTIALLY PENETRATING WELLS")

PROJECT NO.: 4-0118-87

CLIENT: Rockwell International

ITE LOCATION: Rocky Flats Plant

DATE OF SLUG TEST: 10-14-87

FIELD INVESTIGATOR: Kevin McMeill

WELL MO.: 42-86

INPUT DATA ARE:

INMER CASING BIAMETER = 2.00 INCHES

INMER SCREEN OR OPEN-HOLE BIAMETER = 2.00 INCHES

DIAMETER OF DRILLED HOLE = 7.50 INCHES

LENGTH OF SCREEN OR INTAKE PORTION = 9.74 FEET
BEPTH FROM STATIC LEVEL TO BOTTOM OF SCREEN = 9.74 FEET
THICKNESS OF SATURATED AGUIFER ZONE = 9.74 FEET

ESTIMATED POROSITY OF BRAVEL PACK = .25

FALLING-HEAD INDEX . O ("1" IF FALLING, "0" IF RISING)

MUMBER OF HEAD-TIME DATA POINTS =

TIME	HEAD
(sec)	(FEET)
1.00	. 630
2.00	.420
3.00	.270
4.00	.170
5.00	. 120
6.00	.070
7.00	.040
8.00	. 030
9.00	.020
10.00	.010
15.00	.010

HO WAS COMPUTED FROM INTERCEPT OF PLOT OF LOG(H) VS. TIME

SUCCESSIVE COMPUTED VALUES FOR HO (FEET)

.6201

1.0397

.9989

METHOD OF BOUWER AND RICE

COMPUTED RESULTS USING DIAMETER OF DRILLED HOLE:

PERMEABILITY = 1.79E-03 FT/sec = 5.45E-02 CM/sec

TRANSMISSIVITY = 1.74E-02 FT#+2/sec

COMPUTED RESULTS USING DIAMETER OF CASING AND SCREEN:

PERMEABILITY = 5.97E-04 FT/sec = 1.82E-02 CM/sec

TRANSMISSIVITY = 5.82E-03 FT##2/sec

Water Level Data for Rockwell (Rocky Flats)

Date Measured	Depth to Water from TOC	Elevation TOC (ft)	Water Level Elev. (ft)
** Well Numbe	r: 4286		
09/22/86	21.48	5956.43	5934.95
09/23/86	22.12	5956.43	5934.31
09/24/86	22.17	5956.43	5934.26
10/13/86	22.92	5956.43	5933.51
01/01/87	46.75	5956.43	5909.68
02/01/87	15.63	5956.43	5940.80
03/12/87	14.08	5956.43	5942.35
05/07/87	10.13	5956.43	5946.3 0
06/02/87	12.60	5956.43	5943.83
07/08/87	13.40	5956.43	5943. 03
07/23/87	15.60	5956.43	5940.83
08/03/87	17.20	5956.43	5939.23
09/01/87	19.30	5956.43	5937.13
09/03/87	19.60	5956.43	5936. 83
09/03/87	19.60	5956.43	5936.83
09/28/87	20.40	5956.43	5936. 03
11/03/87	22.30	5956.43	5934.13
12/01/87	22.03	5956.43	5934. 40

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Boring	No.: 43-86	
Comple	ted as well? Yes	
Data in	File	
<u> </u>	Log of Borehole	
<u> </u>	Well Construction Summaries	
<u>x</u>	Well Development Summaries	
	Hydraulic Conductivity Test Data	•
	and Results	
	Packer Test Data and Results	
· x	Water Level Data	

LOG OF BORING NO. Project: Rocky Flats Plant Coordinates N 36415.0 E 22761.7 9/25/86 **Date Drilled Ground Surface Elevation** 5970.39 Hollow Stem Auger Boring Method Penetration Resistance Other Depth Sample Graphic (feet) Type Log Elev. Tests **Material Description** (Blows/Inch) 20 40 ROCKY FLATS ALLUVIUM 0-1.0'-Sample. 000 Recovered 1.0/1.0'=100%. GRAVEL: grayish brown (5YR 3/2); 50-60% granitic pebbles and cobbles; 30-40% sand and clay; caliche stringers; poorly sorted; unconsolidated; dry. 1.0-3.0'-Sample. Recovered 0.0/2.0'=0%. Drilled with center bit in augers. 3.0-3.3'-Sample. Recovered 0.2/0.3'=67%. SAND: moderate brown (5YR 4/4); 80% clayey sand; 20% quartzite cobbles; poorly sorted; unconsolidated; dry. 3.3-4.0'-Sample. Recovered 0.0/0.7'=0%. Drilled with center bit in augers. 4.0-5.4'-Sample. Recovered 1.0/1.4'=74%. SAND: pale yellowish brown (10YR 6/2); 60% coarse to fine- grained sand; 10-20% clay; 20% granitic pebbles; poorly sorted; unconsolidated; dry. 5.4-5.5'-Sample. Recovered 0.2/0.2=100%. SAND: Same as above; dry.

R	m	ar	ks.

Logged by: C. Walker

5.5-6.0'-Sample.
Recovered 0.0/0.5'=0%.
Drilled with center bit in

6.0-8.0'-Sample.

Recovered 0.9/2.0 = 45%. SAND: Same as above; dry.

augers.

Checked by:___

Project No.

106P06222

Hydro-Search, Inc.

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LOG OF BORING NO. 43-86 Project: Rocky Flats Plant 9/25/86 Coordinates N 36415.0 **Date Drilled** E 22761.7 5970.39 Ground Surface Elevation Hollow Stem Auger Boring Method Penetration Resistance Other Elev. Depth Sample Graphic (feet) (feet) Type Log Tests **Material Description** (Blows/Inch) 20 40 8.0-10.0'-Sample. Recovered 2.2/2.0'=110%. SAND: moderate brown (5YR 4/4); fine to mediumgrained sand; trace coarse-grained sand; poorly sorted; subangular; unconsolidated; dry. 10.0-12.0'-Sample. Recovered 1.7/2.0'=85%. 10.0-11.1'. SAND: Same as above; dry. 11.1-12.0'. **GRAVEL:** moderate brown (5YR 4/4); grades downward to coarse to medium-grained sand; poorly sorted; subangular; unconsolidated; damp. 0.00°° 12.0-14.0'-Sample. Recovered 2.0/2.0'=100%. GRAVEL: moderate brown (5YR 4/4); quartzite pebbles and cobbles (20-30%) and coarse-0 grained sand; poorly sorted; angular to sub-60a angular; unconsolidated; 0000 14.0-15.5'-Sample. Recovered 0.8/1.5'=53%. 30:1 GRAVEL: moderate yellowish brown (10YR 5/4); granitic pebbles and cobbles to fine-grained sand; poorly sorted; unconsolidated; dry. 0.00 15.5-16.0'-Sample. Recovered 0.0/0.5'=0%. Drilled with center bit in 7000 augers. 16.0-16.5'-Sample. Recovered 0.5/0.5'=100%. GRAVEL: Same as above; dry. ARAPAHOE FORMATION 16.5-18.0'-Sample. Recovered 1.3/1.5'=87%. Remarks Checked by: Logged by: C. Walker Project No. Hydro-Search, Inc.

106P06222

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Project:

Rocky Flats Plant

LOG OF BORING NO. 43-86

Date Drilled

9/25/86

Coordinates N 36415.0 E 22761.7

Bori	ng Met	hod	Hollow	Stem Auger Ground 8u	rface Elevati	on 5970.39	
Elev. (feet)	Depth (feet)	Sample Type	Graphic Lóg	Material Description	Penetration Resistance (Blows/Inch) 20 40	Content 20 40	Other Tests
	16			16.5-17.0'. CLAYSTONE: dark yellowish orange (10YR 6/6) to olive gray (5Y 5/2); consolidated; damp.		-	
	1 1			/17.0-17.3'. SANDSTONE: yellowish gray (5Y 7/2); fine-grained; friable; moderately sorted; subangular to subrounded;			
	 			friable; poorly moderatley well cemented; damp. 17.3-17.8'. CLAYSTONE: dark yellowish orange (10YR 6/6) to olive gray			
	1			(5Y 5/2); consolidated; damp. 17.8-18.0'. SANDSTONE: yellowish gray (5Y 7/2); fine-grained; friable;		-	·
	-			moderately sorted; subangular to subrounded; poorly cemented; damp. 18.0-20.0'-Sample. Recovered 1.5/2.0'=75%.		-	
	20-			18.0-18.5'. CLAYSTONE: dark yellowish orange (10YR 6/6) to olive gray (5Y 5/2); consolidated; damp.	·	- - -	
	1		鑉	18.5-20.0'. SANDSTONE: yellowish gray (5Y 7/2); fine-grained; friable; moderately sorted; subangular to subrounded; poorly cemented; fractures			
	- 22			with dusky yellow brown (10YR 2/2) mottles: damp. 20.0-22.0'-Sample. Recovered 2.0/2.0'=100%.			
	1			20.0-20.8'. CLAYSTONE: moderate yellowish brown (10YR 5/4) and yellowish gray (5Y 7/2); silty; laminated; poorly consoli- dated; damp.			
	1			20.8-22.0'. SANDSTONE: moderate yellow (5Y 7/6); medium to fine-grained; clayey; moderately sorted; subangular to subrounded; poorly cemented; damp. TOTAL DEPTH: 22.0'			
Remai	24 rks		Logged	by: C. Walker		Checked by;	P
Project No. 106P06222				Hydro-Search,	Inc.	Page 3 of 3	

WELL	43-86	
WELL		_

CONSULTING HYDROLOGISTS-GEOLOGISTS

WELL CONSTRUCTION SUMMARY 5970.39' N 36415.0 E 22761.7 ELEVATION: GROUND LEVEL -CONSTRUCTION TIME LOG: DRILLING SUMMARY: START FINISH TOTAL DEPTH Well: 16.75' Hole: 22.00' TASK DATE DATE TIME TIME 1986 1986 DRILLING: 10 7½" auger 9/25 1645 9/26 1305 Boyles Brothers Drilling Co. DRILLER __ 15865 W. 5th Avenue Golden, CO (Tony Robinson) Acker GEOPHYS. LOGGING: RIG _ Blade bit and bull nose bit CASING: BIT(S) -9/26 _1453 9/26 Walker 2" stainless 1500 45 DRILLING FLUID None 9/26 1500 9/26 1520 SURFACE CASING 4' x 5" steel w/ locking FILTER PLACEMENT 9/26 1526 9/26 1540 CEMENTING: PERSONNEL WELL DESIGN: 10/10 0820 10/10 0820 LEVELOPMENT: 20 BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG ___ OTHER: Bentonite 9/26 1520 9/26 1526 CASING STRING(S): C=CASING S=SCREEN 9/26 1445 0.00' 3.99' C1 9/26 1453 3.99'- 16.75' SI_ 25 WELL DEVELOPMENT See Well Development Summary Sheet. 30 CASING: CI 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush Plant jointed. Rocky Flats SCREEN: SI 2" I.D. Sch. 5 type 316 stain-**-**35 less steel, threaded and flush COMMENTS: jointed, 0.010" wire wrap screen 0.25' welded bottom cap. No water encountered during drilling. CENTRALIZERS Type 304 stainless steel Top of stainless steel casing: 2.10' 9.61' - 10.80' - 40 Cave from TD to 17.201 FILTER MATERIAL 32-42 silica sand 3.00' - 16.80' CEMENT Portland Type I 0.00' - 2.10' 45 OTHER 3/8" bentonite pellets 2.10' - 3.00' 16.80' - 17.20' .50

HYDRO-SEARCH RENO-DENVER

WELL	43–86

WELL DEVELOPMENT SUMMARY

10-10-86 0820 — — — — Dry	DATE	TIME	METHOD	VOLUME	APPEARANCE	COMMENTS
	10-10-86	0820	_	_		<u>Dry</u>
	·					
						·
						·

Water Level Data for Rockwell (Rocky Flats)

Date Measured	Depth to Water from TOC	Elevation TOC (ft)	Water Level Elev. (ft)
** Well Numbe	r: 4386		
10/10/86	-1.00	5972.49	
10/13/86	-1.00	5972.49	
11/26/86	16.76	5972.49	5955. 73
01/01/87	18.33	5972.49	5954.16
02/01/87	16.75	5972.49	5955.74
03/11/87	15.42	5972.49	5957.07
05/08/87	13.10	5972.49	5959.39
06/02/87	14.87	5972.49	5957.62
07/07/87	14.20	5972.49	5958. 29
07/27/87	16.10	5972.49	5956.39
08/04/87	16.80	5972.49	5955.69
09/01/87	16.50	5972.49	5955.99
09/29/87	18.00	5972.49	5954.49
11/03/87	18.30	5972.49	5954.19
12/01/87	16.75	5972.49	5955.74

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Boring	No.: 46-86
Comple	ted as well? yes
Data in	File
<u> x</u>	Log of Borehole
<u> </u>	Well Construction Summaries
<u> x</u>	Well Development Summaries
	Hydraulic Conductivity Test Data
	and Results
X	Packer Test Data and Results
X	Water Level Data

LOG OF BORING NO. 46-86 Project: Rocky Flats Plant Coordinates N 37944.7 E 15181.3 9/16/86, 9/17/86, 10/9/86 **Date Drilled** Ground Surface Elevation 6065.72' Boring Method Casing Driver /NC Core Penetration Resistance Other Tests Depth Sample Graphic (feet) Type Log Material Description (Blows/inch) 20 20 40 ROCKY FLATS ALLUVIUM 0-8.0'-Cuttings. GRAVEL: gray orange (10YR 7/6); granite and quartzite pebbles and cobbles; some silt and quartz sand; poorly sorted; unconsolidated; dry. . 0 8.0-13.0'-Cuttings. GRAVEL: same as above; wet. 13.0-17.0'-Cuttings. GRAVEL: moderate brown (5YR 4/4); granite, quartzite and muscovite pebbles; some sand and silt; trace limonitic clay; poorly sorted; angular; unconsolidated; , , , , damp. 17.0-20.0'-Cuttings. 0000 GRAVEL: moderate brown (5YR 4/4); 40-60% quartzite cobbles; sandy and silty; poorly sorted; unconsolidated; damp. Logged by: T. Gulliver Remarks Checked by: Q

Hydro-Search, Inc.

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Project No.

106P06222

Project:

Rocky Flats Plant

LOG OF BORING NO. 46-86

Date Drilled Boring Method Casing Driver/NC Core

106P06222

9/16/86, 9/17/86, 10/9/86

Coordinates N 37944.7 E 15181.3 Ground Surface Elevation 6065.72'

Boring Method			Casing Driver/MC Core Ground Surface Elevation 6065.72				
Elev. (feet)	Depth (feet)	Semple Type	Graphic Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	Content 20 40	Other Tests
	20		85	20.0-29.0'-Cuttings.			
			0.0	GRAVEL: moderate brown			
	-		0.0	(5YR 4/4) granite and		_	
	_		830	quartzite cobbles and			
1			000	boulders, coarse to fine- grained sand and silt;			
1	-		B.O.	poorly sorted; angular;		-	
ı	_		0.0%	unconsolidated; dry to damp.		_	·
	_		00	damp.			
			$\tilde{\mathbf{C}}$			4	
	_					5	
	—25 —		12:00			_	
ı	_		0.0			_	
		·	Q			_	
ı			5.50				
I			2.0				
			000				
. i			5.0€				
1			2000				
- 1	\dashv	·	: D.O			7	
1	-		300	29.0-36.0'-Cuttings.			٠
ŀ	-		٠ <u>٠</u> ٥	GRAVEL: same as above; damp.			
ŀ	30		\circ	dump.		- 1	
	-						
			1,00				
I	_		ර ී 0 ප				
1			200				
1			0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,				
- 1							
j			200				
			200				
I			.00.0				
		I	000			· · · · · 1	
ŀ	— 35 —		osn.			1	,
ı	-		000			7	
- 1	-		\triangle	36.0-44.0'-Cuttings.			
1	-		್ಕಾ	GRAVEL: same as above; damp.		4	
		[100	camp.		-	
	4		00%	į			
	_	{	o.Ω.			- 4	
			030			- 4	
1			000				
ł		ľ	ઝું°ે.			ال ا	
	40		· % 0.1			<u> </u>	~
Remar	ks	L	ogged l	by: T. Gulliver		Checked by:	H
Proje	ct No.	^^		Hydro-Search	20		

Hydro-Search, Inc.

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LOG OF BORING NO. 46-86 Rocky Flats Plant Project: Coordinates N 37944.7 E 15181.3 9/16/86, 9/17/86, 10/9/86 **Date Drilled** Ground Surface Elevation 6065.72' Boring Method Casing Driver/NC Core Penetration Resistance CALLEL Other Depth Sample Graphic (feet) Type Log Elev. Tests **Material Description** (Blows/Inch) 20 20 40 44.0-52.5'-Cuttings. 0.0 GRAVEL: moderate brown (5YR 4/4); 40-60% 00quartzite cobbles; silty and sandy matrix; poorly sorted; unconsolidated; damp. .00 00 000 D:00 52.5-53.0'-Cuttings. SAND: moderate brown (5YR 4/4); very fine-grained; 000 silty; poorly sorted; 00000 unconsolidated; damp. 53.0-57.0'-Cuttings. BOULDERS: moderate brown 0000 (5YR 4/4); 60-70% granitic boulders; silty gravel matrix; poorly sorted; 000 unconsolidated; moist. 200 57.0-63.0'-Cuttings. GRAVEL: moderate brown (5YR 4/4); 30-50% granitic pebbles and cobbles; silty sand matrix; poorly sorted; unconsolidated; moist. 60 Logged by: T. Gulliver Checked by: Remarks Project No. Hydro-Search, Inc. 106P06222 Page 3 of 9

LOG OF BORING NO. Rocky Flats Plant Project: Coordinates N 37944.7 Date Drilled 9/16/86, 9/17/86, 10/9/86 E 15181.3 Boring Method Ground Surface Elevation 6065.72' Casing Driver/NC Core Penetration Resistance Other Elev. Depth Sample Graphic (feet) (feet) Type Log Tests **Material Description** (Blows/Inch) 40 20 20 63.0-65.0'-Cuttings. GRAVEL: moderate brown (5YR 4/4); granite and quartzite pebbles and cobbles; clayey sand matrix; poorly sorted; unconsolidated; moist. 65.0-80.0'-Cuttings. GRAVEL: moderate brown 00 (5YR 4/4); silty sand matrix; poorly sorted; unconsolidated; moist. Remarks Checked by: Logged by: T. Gulliver Project No. Hydro-Search, Inc. 106P06222 Page 4 of 9

LOG OF BORING NO. Project: Rocky Flats Plant 9/16/86, 9/17/86, 10/9/86 Coordinates N 37944.7 **Date Drilled** E 15181.3 Ground Surface Elevation 6065.72' Casing Driver/NC Core Boring Method Penetration Resistance Other Elev. Depth Sample Graphic feet) (feet) Type Log Elev. Tests Material Description (Blows/Inch) 20 20 40 0000 80.0-88.0'-Cuttings. GRAVEL: moderate brown (5YR 4/4); 70% granite and quartzite pebbles and cobbles; sandy; poorly 0 0 sorted; unconsolidated; moist. OBO. Ó 0. $\mathsf{O}_{\mathsf{0}}\mathsf{O}$ 88.0-90.0'-Cuttings. GRAVEL: moderate brown 00.0 (5YR 4/4); granite and quartzite pebbles and cobbles; silty; poorly sorted; unconsolidated; LARAMIE FORMATION 90.0-96.5'-Cuttings. CLAYSTONE: dark yellowish orange (10YR 6/6); laminated; consolidated; wet. 97.0-102.0'-Sample. Recovered 0.0/5.0'. Cuttings indicate a medium light gray (N 6) claystone with black (N 1) organic wood fragments. 100 Remarks Checked by: Logged by: T. Gulliver

Hydro-Search, Inc.

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Project No.

106P06222

Project: Rocky Flats Plant

Project No.

106P06222

LOG OF BORING NO.

Date Drilled 9/16/86, 9/17/86, 10/9/86 Boring Method Casing Driver/NC Core Coordinates N 37944.7 E 15181.3 Ground Surface Elevation 6065.72'

Bor	ing Met	noa	ALL SILLE	Ground Su	rtace Elevati	On 6065.72	
Elev. (feet)	Depth (feet)	Semple Type	Graphic Log	Material Description	Penetration Resistance (Blows/Foot) 20 40	Water Content (%) 20 40	Other Tests
	100			102.0-105.0'-Sample. Recovered 0.4/3.0'=13%. RQD=0.4/0.4'=100%. CLAYSTONE: light olive gray (5Y 5/2) to olive gray (5Y 3/2); medium light gray (N 5) mottles; dark yellowish orange (10YR 6/6) limonite stain; vertical fractures with limonite stains; fine- grained sand pocket in center of core; some wood fragments; firm; damp. 105.0-109.5'-Depth correction. CLAYSTONE: Same as above; damp. 109.5-112.5'-Sample. Recovered 0.4/3.0'=13%. RQD=0/0.4'=0%. CLAYSTONE: Same as above; iron concretions; damp. 112.5-116.5'-Sample. Recovered 3.0/4.0'=75%. RQD=0/3.0'=0%. CLAYSTONE: medium gray (N 5) to light olive gray (5Y 5/2) claystone; firm; damp. 116.5-121.5'-Sample. Recovered 2.7/5.0'=54%. RQD=2.5/2.7'=93%. CLAYSTONE: medium dark gray (N 4); light olive brown (5Y 5/2) to light olive gray(5Y 5/6) mottles; some silt; vertical fracture; firm; dry to damp.			
Remarks Logged by: T. Gulliver Checked by:							

Hydro-Search, Inc.

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Project:

Rocky Flats Plant

LOG OF BORING NO. 46-86

Date Drilled 9/16/86, 9/17/86, 10/9/86

Coordinates N 37944.7 E 15181.3

Boring Method Casing Driver/NC Core

Ground Surface Elevation 6065.72'

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/Foot) 20 40	Water Confent (%) 20 40	Other Tests
(feet.	120	I ype		121.5-126.5'-Sample. Recovered 2.6/5.0'=52\cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot			
	_						:
ı	140					1 1 1 1 1	

Remarks Logged by: T. Gulliver

Checked by:

Project No.

106P06222

Hydro-Search, Inc.

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Project: Rocky Flats Plant

LOG OF BORING NO. 46-86

Date Drilled 9/16/86, 9/17/86, 10/9/86 Boring Method Casing Driver/NC Core

Coordinates N 37944.7 E 15181.3 Ground Surface Elevation 6065.72'

				011 00/03.72	
Elev. Dept (feet) (feet	Sample Grap Type Lo	hic Material Description	Penetration Resistance (Blows/Foot) 20 40	Water Content 20 40	Other Tests
140		141.5-146.5'-Sample. Recovered 3.8/5.0'=76%. RQD=2.8/3.8'=74%. SILTSTONE: medium light gray (N 6); sandy; interbedded with thin to thick beds of fine to very fine-grained SANDSTONE; moderate sorting; silty; abundant convoluted contacts; beds dipping at 30 to 50 degrees; firm; damp to moist. 146.5-151.1'-Sample. Recovered 0.5/5.0'=10%. RQD=0/0.5'=0%. SILTSTONE: Same as above with some claystone; sandstone laminations in fragments; damp to moist.			
150 		151.1-154.5'-Sample. Recovered 3.0/3.0'=100%. RQD=0/3.0'=0%. SILSTONE: Same as above with very fine-grained, medium gray (N 5) sand; damp to moist.			
——155—— ———————————————————————————————		154.5-156.5'-Sample. Recovered 0.7/2.0'=35%. RQD=0/0.7'=0%. SILTSTONE: Same as above; medium gray (N 5) with medium dark gray (N 4) laminations of claystone; firm; damp.			
160			[_,	^ ^~
Remarks Log	ged by: T.	Aulliver		Checked by:	JUN P

Project No. 106P06222

Hydro-Search, Inc.

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Project: Rocky Flats Plant

106P06222

LOG OF BORING NO. 46-86

Date Drilled 9/16/86, 9/17/86, 10/9/86 Boring Method Casing Driver/NC Core Coordinates N 37944.7 E 15181.3 Ground Surface Elevation 6065.72'

Borning Marting ward are Ground Surface Flavation 0003:12							
Elev. Dep (feet) (fee	th Sample et) Type	Graphic Log	Material Description	Penetration Resistance (Blows/Foot) 20 40	Water Content (%) 20 40	Other Tests	
160 ————————————————————————————————————			156.5-161.5'-Sample. Recovered 5.0/5.0'=100%. RQD=4.0/5.0'=80%. SILTSTONE: Same as above with interbedded silty sandstone at 157.5' to 158.5' and 160.5' to 161.5'; sandstone is medium gray (N 4); silty; very fine to fine-grained; laminated; cross-bedded; horizontal bedding apparent; firm; tight; moist. 161.5-166.5'-Sample. Recovered 2.3/5.0'=46%. RQD=0.5/2.3'=22%. SILTSTONE: Same as above; clayey; interbedded with claystone; thin (0.3') calcite cemented sandy cement; moist. TOTAL DEPTH: 166.5'				
Remarks _T			11.		Checked by:	JP	
<u></u>	ogged by:	T. Gu	lliver			70	
Project No).	i	Hydro-Sparch I	lno.	•		

Hydro-Search, Inc.

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WELL	46-86	
W ELL		

			W V	WELL CONSTR	RUCTION S	UMM	ARY		
			M. C	LOCATION or COORDS:	ELEVATION: GROUP	ND LEVEL		65.72	
				N 37944.7 E 15181.3	тор о	F CASIN	G 60	67.89 <u>'</u>	
1	20			DRILLING SUMMARY:	CONSTRUCTION	TIME	LOG:		
				TOTAL DEPTHWell: 160.79' Hole: 166.50' BOREHOLE DIAMETER 0.00' - 96.50': 5 5/8"		START		FINISH	
			Maj		TASK	DATE I	TIME	DATE	TIME
-	l		Rea	96.50' - 166.50': 4½"	DRILLING:	1986		1986	11
				DRILLER Boyles Brothers Drilling Co.		9/16	_0840_	9/16	1643
N	40		% =2	15865 W. 5th Ave. Golden, CO	5.5/8" casing advancer NC Core	10/9	1100	10/15	1645
自			16	(Tom High, Robert Roach)	Reaming	_10/20		10/20	1511
≱]				(Tom High, Robert Roach) (1.00' - 96.50': Casing advancer; 96.50' - RIG 160.79': Failing	GEOPHYS. LOGGING:	10/20	1310	10/20	1511
ij			S	BiT(s) 0.00' - 96.50': Down hole hammer'.	CASING:				
Ę.	-60	Į.		96.50' - 166.50': Coring bit	<u>5" steel</u>	9/16	_0840_	9/16	1643
Gulliver/T. Murphy		Į.	O	DRILLING FLUID 0.00' - 96.50': None	2" stainless	10/21	1600	10/21	1645
9			5	96.50' - 166.50: air/water mist		10/21	1645	10/21	1120
				SURFACE CASING 5" x 98.5' steel w/ locking	FILTER PLACEMENT: CEMENTING:	10/21	1228	10/23	1000
Ē	00		练 9	WELL DESIGN:	CEVELOPMENT:	_10/30	1050	11/13	1100
Š	-00		Se se	BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG	OTHER:				
PERSONNEL				CASING STRING(S): C=CASING S=SCREEN	<u>Bentonite</u>	10/22	1602	10/22	1605
؎				0.00' 96.50' C1		10/22	1140	10/22	1150
				0.00'- 140.33' C2	<u>Packer testi</u> n	10/16	0829	10/19	1030
	100			140.33'- 160.79' S1					
1									
					WELL DEVELOP	MENT			
					See Well Develo	opment S	Summary	Sheet.	
	-1 20								
	120			CASING: C15" I.D. steel surface casing					
				c22" I.D. Sch. 5 type 316 stain-		 			
r I and				c3 less steel, threaded and flush					
- 1 1				c4 jointed.			· · · · · · · · · · · · · · · · · · ·		
riats	740	= .		SCREEN: SI 2" I.D. Sch. 5 type 316 stain-					
				s2 less steel, threaded and flush s3 jointed, 0.010" wire wrap screen,	COMMENTS:				
OCKY				\$4 0.25' welded bottom cap.	Water encounte	red at (60' dur	ing dril	ling.
		≣₿		CENTRALIZERS Type 304 stainless steel					
	760			150.49' - 151.66'	Top of stainle	ss stee	l casing	3:2.17	1
Ш	100								
	•	7	71	FILTER MATERIAL 32-42 silica sand 138.90' - 163.00'	Cave from TD t	o 165.00	<u>)' </u>		
ч			11	CEMENT Portland Type I					
	-1 80			0.00' - 138.90'					
	100		11	OTHER 3/8" bentonite pellets					<u>.</u>
				137.50' - 138.90'					
1			11	163,00' - 165,00'					
1									
t	200			HYDRO-SEARCH RENO-DENVER	CONSULTING HY	DROLO	GISTS-	GEOLO	GISTS

LOCATION Golden, CO

WELL DEVELOPMENT SUMMARY

DATE	TIME	METHOD	VOLUME	APPEARANCE	COMMENTS
10-30-86	1050				<pre>1 Well Bore Volume = 0.93 gals. 10 Well Bore Volumes = 9.33 gals.</pre>
10-30-86	1050	Airlifted		Clear with medium brown spray on bottom	_
11-3-86	1320	Bailed	6.5 gals.	Medium grayish brown	6.5/9.33 gals. purged to date
11-4-86	1030	Bailed	1.5 gals.	Light brown with sand - turbid	8.0/9.33 gals. purged to date
11-5-86	0820	Bailed	1.4 gals.	Med-light brown w/ silt, turbid	9.41/9.33 gals. purged to date
11 -6- 86	1230	Bailed	l gal.	Med-light brown, turbid	10.4/9.33 gals. purged to date
11-7-86	0945	Bailed	1.3 gals.	Medium brown, very turbid	11.7/9.33 gals. purged to date
11-10-86	0945	Bailed	2.5 gals.	Medium brown, very turbid	14.2/9.33 gals. purged to date
11-11-86	1330	Bailed	l gal.	Light brown, silty	15.2/9.33 gals. purged to date
11-12-86	1000	Bailed	l gal.	Light-medium brown, turbid	16.2/9.33 gals. purged to date
11-13-86	1100	Bailed		Light-medium brown	Sampled
·					

PACKER TEST ANALYSIS WELL NO. 46-86

ROCKY FLATS PLANT JOB NO. 106P06222

DATE TESTED: 10/17/86 BY: C. WALKER
TEST INTERVAL (FEET BELOW G.S.): 130.22 - 140.25

MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 20.00

K = ---- LN(--) 2(PI)(L)(H) R

1ST P1/3 TEST

Q = INJECTION RATE = .00035200 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 10.03 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)

= 20.00 + 5.90 + 1.98 * 2.31 = 30.47

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000076 FT/MIN K = .00000038 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00097071 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 10.03 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)

= 20.00 + 5.90 + 28.30 * 2.31 = 91.27

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000070 FT/MIN
K = .00000035 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00025588 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 10.03 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)

= 20.00 + 5.90 + 1.70 * 2.31 = 29.83

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000056 FT/MIN K = .00000029 CM/SEC

PACKER TEST ANALYSIS WELL NO. 46-86

ROCKY FLATS PLANT JOB NO. 106P06222

DATE TESTED: 10/17/86 BY: C. WALKER
TEST INTERVAL (FEET BELOW G.S.): 140.64 - 150.67

MATERIAL TESTED: ARAPAHOE SANDSTONE
DEPTH TO WATER (FEET BELOW G.S.): 20.00

K = ---- LN(--) 2(PI)(L)(H)R

1ST P1/3 TEST

Q = INJECTION RATE = .00003385 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 10.03 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)

= 20.00 + 5.90 + 1.80 * 2.31 = 30.06

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000007 FT/MIN
K = .00000004 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00299201 (FEET3/MIN) L = LENGTH OF TEST INTERVAL = 10.03 FEET TEST INTERVAL IS BELOW WATER TABLE HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET) = 20.00 + 5.90 + 30.50 * 2.31 = 96.35

R = BOREHOLE RADIUS = .16 FEET

2ND P1/3 TEST

Q = INJECTION RATE = .00043865 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 10.03 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)

= 20.00 + 5.90 + 1.90 * 2.31 = 30.29

R = BOREHOLE RADIUS = .16 FEET

PACKER TEST ANALYSIS WELL NO. 46-86

ROCKY FLATS PLANT JOB NO. 106P06222

DATE TESTED: 10/17/86 BY: C. WALKER

TEST INTERVAL (FEET BELOW G.S.): 151.00 - 161.03

MATERIAL TESTED: ARAPAHOE SANDSTONE

DEPTH TO WATER (FEET BELOW G.S.): 20.00

Q L K = ----- LN(--) 2(PI)(L)(H) R

1ST P1/3 TEST

Q = INJECTION RATE = .00005415 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 10.03 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 20.00 + 5.90 + 1.80 * 2.31 = 30.06

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000012 FT/MIN

K = .00000006 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00044542 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 10.03 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 20.00 + 5.90 + 33.25 * 2.31 = 102.71

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000028 FT/MIN

K = .00000014 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00000000 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 10.03 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 20.00 + 5.90 + 1.90 * 2.31 = 30.29

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000000 FT/MIN

K = .00000000 CM/SEC

Page No. 12/11/87 90

Water Level Data for Rockwell (Rocky Flats)

Date Measured	Depth to Water from TOC	Elevation TOC (ft)	Water Level Elev. (ft)	
** Well Numbe	er: 4686			
10/30/86	100.27	6067.89	5967.62	
11/03/86	137.21	6067.89	5930.68	
11/04/86	150.00	6067.89	5917.89	
11/05/86	150.00	6067.89	5917.89	
11/07/86	150.00	6067.89	5917.89	
11/10/86	150.00	6067.89	5917.89	
11/11/86	145.52	6067.89	5922.37	
11/12/86	157.43	6067.89	5910.46	
11/13/86	157.71	6067.89	5910.18	
11/26/86	143.35	6067.89	5924.54	
01/01/87	85.19	6067.89	5982.70	
02/01/87	78.00	6067.89	5989.89	
03/31/87	74.23	6067.89	5993.66	
05/06/87	72.25	6067.89	5995.64	
06/01/87	112.20	6067.89	5955.69	
07/08/87	117.20	6067.89	5950.69	
08/03/87	92.20	6067.89	59 75.69	
08/13/87	87.90	6067.89	5979.99	
09/28/87	158.50	6067.89	5909.39	
11/02/87	105.70	6067.89	5962.19	

INDEX OF DATA

Boring No.: 48-86				
Completed as well? yes				
Data in File				
X	Log of Borehole			
X	Well Construction Summaries			
	Well Development Summaries			
	Hydraulic Conductivity Test Data			
	and Results			
	Packer Test Data and Results			
X	Water Level Data			

Project No.

106P06222

Rocky Flats Plant

LOG OF BORING NO.

48-86

Date Drilled 9/18/86, 9/19/86, 10/23/86 - 11/13/86 Coordinates N 36079.2 E 15168.7

Boring Method Casing Driver/NC Core

Ground Surface Elevation

6074.68

Page 1 of 11

ROCKY FLATS ALLIVIUM O-7.0'-Cuttings. GRAVEL: soderate brown (10YR 4/4); granite and quartzite cobles and boulders; silty sand matrix; poorly sorted; unconsolidated; O-7.0'-Cuttings. BOULDER: large quartzite boulder. O-7.0'-Cuttings. GRAVEL: moderate brown (10YR 4/4); granitic O-7.0'-Cuttings. GRAVEL: moderate brown (10YR 4/4); gran	ther ests
0-7.0'-Cuttings. GRAVEL: moderate brown (10YR 4/4); granite and quartzite cobbles and boulders; solty sand matrix; poorly sorted; unconsolidated; dry. 7.0-9.0'-Cuttings. BOULDER: large quartzite boulder. 9.0-33.0'-Cuttings. GRAVEL: moderate brown (10YR 4/4); granitic granite moderate brown (10YR 4/4); granitic granitand cobbles; 15- 304 sand; poorly sorted; unconsolidated; damp.	
decrate brown (10YR 4/4); granite and quartzite cobbles and boulders; silty sand matrix; poorly sorted; unconsolidated; dry. 7.0-9.0'-Cuttings. BOULDER: large quartzite boulder. 9.0-33.0'-Cuttings. GRAVEL: moderate brown (10YR 4/4); granitic pebbles and cobbles; 15- 30t sand; poorly sorted; unconsolidated; damp.	
cobbles and coulders; silty sand matrix; poorly sorted; unconsolidated; dry. 7.0-9.0'-Cuttings. BOULDER: large quartzite boulder. 9.0-33.0'-Cuttings. GRAVEL: moderate brown (10YA 4/4); grantitic pebbles and cobbles; 15-30\$ 30\$ sand; poorly sorted; unconsolidated; damp.	
cobbles and boulders; silty sand matrix; poorly sorted; unconsolidated; dry. 7.0-9.0'-Cuttings. BOULDER: large quartzite boulder: 9.0-33.0'-Cuttings. GRAVEL: moderate brown (10YR 4/4); granitic pebbles and cobbles; 15- 30t sand; poorly sorted; unconsolidated; damp.	
sorted; unconsolidated; dry.	
7.0-9.0'-Cuttings. BOULDER: large quartzite boulder. 9.0-33.0'-Cuttings. GRAVEL: moderate brown (10YR 4/4); granitic pebbles and cobbles; 15-30% sand; poorly sorted; unconsolidated; damp.	
BOULDER: large quartzite boulder. 9.0-33.0'-Cuttings. GRAVEL: moderate brown (10YR 4/4); granitic pebbles and cobbles; 15- 30% sand; poorly sorted; unconsolidated; damp.	
BOULDER: large quartzite boulder. 9.0-33.0'-Cuttings. GRAVEL: moderate brown (10YR 4/4); granitic pebbles and cobbles; 15- 30% sand; poorly sorted; unconsolidated; damp.	
BOULDER: large quartzite boulder. 9.0-33.0'-Cuttings. GRAVEL: moderate brown (10YR 4/4); granitic pebbles and cobbles; 15- 30% sand; poorly sorted; unconsolidated; damp.	
BOULDER: large quartzite boulder. 9.0-33.0'-Cuttings. GRAVEL: moderate brown (10YR 4/4); granitic pebbles and cobbles; 15- 30% sand; poorly sorted; unconsolidated; damp.	
BOULDER: large quartzite boulder. 9.0-33.0'-Cuttings. GRAVEL: moderate brown (10YR 4/4); granitic pebbles and cobbles; 15- 30% sand; poorly sorted; unconsolidated; damp.	
BOULDER: large quartzite boulder. 9.0-33.0'-Cuttings. GRAVEL: moderate brown (10YR 4/4); granitic pebbles and cobbles; 15- 30% sand; poorly sorted; unconsolidated; damp.	
BOULDER: large quartzite boulder. 9.0-33.0'-Cuttings. GRAVEL: moderate brown (10YR 4/4); granitic pebbles and cobbles; 15- 30% sand; poorly sorted; unconsolidated; damp.	
BOULDER: large quartzite boulder. 9.0-33.0'-Cuttings. GRAVEL: moderate brown (10YR 4/4); granitic pebbles and cobbles; 15- 30% sand; poorly sorted; unconsolidated; damp.	
BOULDER: large quartzite boulder. 9.0-33.0'-Cuttings. GRAVEL: moderate brown (10YR 4/4); granitic pebbles and cobbles; 15- 30% sand; poorly sorted; unconsolidated; damp.	
BOULDER: large quartzite boulder. 9.0-33.0'-Cuttings. GRAVEL: moderate brown (10YR 4/4); granitic pebbles and cobbles; 15- 30% sand; poorly sorted; unconsolidated; damp.	
boulder. 9.0-33.0'-Cuttings. GRAVEL: moderate brown (10YR 4/4); granitic pebbles and cobbles; 15- 30% sand; poorly sorted; unconsolidated; damp.	
GRAVEL: moderate brown (10VR 4/4); granitic pebbles and cobbles; 15- 30% sand; poorly sorted; unconsolidated; damp.	
GRAVEL: moderate brown (10YR 4/4); granitic pebbles and cobbles; 15- 30% sand; poorly sorted; unconsolidated; damp.	
(10YR 4/4); granitic pebbles and cobbles; 15- 30% sand; poorly sorted; unconsolidated; damp.	
pebbles and cobbles; 15- 30% sand; poorly sorted; unconsolidated; damp.	
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Remarks Logged by: T. Gulliver & T. Murphy Checked by:	1

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Rocky Flats Plant

LOG OF BORING NO.

48-86

Date Drilled9/18/86, 9/19/86, 10/23/86 - 11/13/86 Coordinates N 36079.2 E 15168.7 Boring Method Casing Driver/NC Core Ground Surface Elevation 6079.68'

Bori	ng Meti	nod Casing D	river/NC Core Ground S	urface Elevat	ion 6079.68'	
Elev. (feet)	Depth (feet)	Semple Graphic Type Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	Content Content 20 40	Other Tests
	20	5°C 0				
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	- 1	000				
	1	000				
	-	888			_	
	4	0000	33.0-35.0'-Cuttings. BOULDER: large quartzite	1	-	
	-	°50°	boulder.		-	
	<b>-</b> 35	20.00			]	
		0.0	35.0-46.0'-Cuttings. GRAVEL: moderate brown			
	4	වන්	(10YR 4/4); granitic pebbles and cobbles; 15-		-	
	4	O.S	30% sand; poorly sorted; unconsolidated; damp.	1	-	
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Remai		Logged by: T.	Gulliver & T. Murphy		Checked by:	WH?

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Rocky Flats Plant

## LOG OF BORING NO.

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Date Drilled 9/18/86, 9/19/86, 10/23/86 - 11/13/86Coordinates N 36079.2 E 15168.7

Soring Method Casing Driver/NC Core Ground Surface Elevation 6079.68'

Borin	g Meti	hod C	asing D	river/NC Core Ground S	Burface Elevati	on 6079.68'	
Elev. (feet)	Depth (feet)	Semple Type	Graphic Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	Water Content 20 40	Other Tests
	40		O.*.				
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Γ	1		0.0				
	-		100%		-]	4	
1	4			46.0-60.0'-Cuttings.		-	
	丁			SAND: moderate brown (10YR 4/4); 20-30%	V		
	4			granitic pebbles and cobbles; sand and silt		_	
	4			matrix; poorly sorted; unconsolidated; moist to		4	
I	+			wet.			
L	-50 -					]	
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emark		Logged	l by: T.	Gulliver & T. Murphy		Checked by	JP

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Rocky Flats Plant

### LOG OF BORING NO.

48-86

Date Drilled 9/18/86, 9/19/86, 10/23/86 - 11/13/86 Coordinates N 36079.2 E 15168.7

Ground Surface Elevation 6079.68' Boring Method Casing Driver/NC Core Penetration Resistance Other Depth Semble Graphic (feet) Type Log Elev. Tests Material Description (Blows/Inch) (feet) 20 40 60.0-70.0'-Cuttings. GRAVEL: moderate brown 0.00 (10YR 4/4); 50-60% granite and quartzite pebbles and cobbles; silty sand
matrix; poorly sorted; unconsolidated; wet. ٥0. LARAMIE FORMATION 70.0-74.0'-Cuttings. CLAYSTONE: light olive gray (5Y 5/2); laminated; soft; wet. 74.0-79.0'-Sample. Recovered 0.3/5.0!=6%. RQD=0/0.3'=0%. CLAYSTONE: medium light gray (N 6/0); abundant wood fragments; trace silt; abundant fractures with limonite stain (10YR 6/6); soft to moderately firm; damp. 79.0-84.0'-Sample. Recovered 2.8/5.0'=56%. RQD=2.6/2.8'=93%. Remarks Logged by: T. Gulliver & T. Murphy Checked by: >

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Rocky Flats Plant

### LOG OF BORING NO.

48-86

Date Drilled 9/18/86, 9/19/86, 10/23/86 - 11/13/86 Coordinates N 36079.2 E 15168.7

Boring Method Casing Driver/NC Core Ground Surface Elevation 6079.68

Bori	ng Met	hod (	Casing Dr	river/NC Core Ground Su	rface Elevati	on 6079,68'	
Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/Foot) 20 40	Water Confent 20 40	Other Tests
	80	Sample		Material Description  79.0-81.2': CLAYSTONE: same as above; yellowish gray (5YR 7/2); soft; iron stained. 81.2-82.2': IRONSTONE: dark reddish brown (10R 3/4); mottled with olive gray (5Y 3/2) claystone; grades into yellowish gray (5Y 7/2) to light gray claystone at 82.3 to 84.0'; trace silt; abundant vertical and horizontal fractures with limonite stains (10YR 6/6); firm to hard; damp.  84.0-89.0'-Sample. Recovered 5.0/5.0'=100%. RQD=3.6/5.0'=72%. CLAYSTONE: medium light gray (N 5/0) to medium gray (N 4/0); silty in places; wood fragments; subvertical and hori- zontal fractures with limonite stain (10YR 6/6); no apparent bedding; highly fractured; soft to moderately firm; damp.  89.0-94.0'-Sample. Recovered 4.0/5.0'=80%. RQD=4.0/4.0'=100%. 89.0-90.8': SILTSTONE: medium light gray (N 4/0); fine sand and clay; grades down into claystone; subvertical fractures (60- 80°) to subhorizontal fractures; firm; damp. 90.8-94.0': CLAYSTONE: same as 84.0-89.0'; fractures at 92.4-94.0'; coated with limonite stain (10YR 6/6); firm; damp.  94.0-99.0'-Sample. Recovered 4.6/5.0'=92%. RQD=2.8/4.6'=61%. CLAYSTONE: same as above; light olive gray (5Y 5/2); numerous horizontal and subhorizontal thin ironstone and limonite	(Blows/Foot)		Tests
	100			layers (<.01") with			

Remarks

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## LOG OF BORING NO.

48-86

Date Drilled 9/18/86, 9/19/86, 10/23/86 - 11/13/86 Coordinates N 36079.2

E 15168.7

Boring Method Casing Driver/NC Core Ground Surface Elevation 6079.68'						
Elev. Depth Sample (feet) (feet) Type	Graphic Materia	al Description	Penetration Resistance (Blows/Foot) 20 40	Water Content 20 40	Other Tests	
100	altered interbed clayey s 0.8' thic  99.0-104 Recovere RQD=1.0/ SILTSTON gray (5Y) light gr very fin limonite (horizon	·				
- - - - -	Recovered RQD= 1.9 CLAYSTON Gray (No. 4) yellowis 6/6); nur subhorize	ontal limonite fractures; soft;				
-110-     	Recovered RQD= 2.9  SILTSTON dark gra  3/0); tra carbonace thin clay	2.0'-Sample. ed 3.0/3.0'=100%. b/3.0'=97%. E: medium gray to ey (N 4/0 to N ace sand; clayey; eous; occasional event beds; h gray (5Y 7/2) eons; slightly ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3.0'-Sample. ed 3				
-115	depth of  114.2-117 Recovere RQD=0.7/2 SILTSTON with sand calcite ( (0.2'); f	rrection: total borehole=114.2'.  7.2'-Sample. d 2.9/3.0'=97%. 2.9'=24%. E: same as above dy laminations; cemented layer ew yellowish gray concretions; mp.				
Remarks Lo	ogged by: T. Gullive:	r & T. Murphy		Checked by:		

Remarks

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Rocky Flats Plant

## LOG OF BORING NO.

48-86

Date Drilled 9/18/86, 9/19/86, 10/23/86 - 11/13/86Coordinates N 36079.2 E 15168.7 Ground Surface Elevation 6079.68

Bori	ng Method	d Casing Dr	river/NC Core Ground Su	rface Elevation	on 6079.68	
Elev. (feet)	Depth Ser (feet) Ty	mple Graphic pe Log	Material Description	Penetration Resistance (Blows/Foot) 20 40	Water Confent (%) 20 40	Other Tests
	120	<b>F3353</b>	117.2-122.2'-Sample.			
	-		Recovered 4.6/5.0'=92%.			
		E 222	RQD=3.5/4.6'=76%.			
		<b>E</b>	SILTSTONE: dark to medium		_	
	11		gray (N 5/0 to N 3/0);			
			interbedded layers of			
	- 1		<pre>silty sandstone; sandy siltstone and clayey</pre>			
			siltstone; bed 0.1		-	
			to 0.2' thick;		_	
	7		carbonaceous; calcareous		_	
1 1			from 121.0-122.2'; bedding			
			dips from 40-50° in		_	
	125		upper 117.2-119.0' then shallows to 15-20° in		_	
	.23		upper 117.2-119.0' then		·	
1	71		shallows to 15-20° at			
			bottom of core; flaser			
	4		bedding characteristics;		-	
			firm; damp.		_	
			122 2-127 21-Comple			
	-1		122.2-127.2'-Sample. Recovered 1.6/5.0'=32%.			
			RQD=0.7/1.6'=44%.		1	
	_1		SILTSTONE: same as above;		-	
			damp to moist.		_	
	71	<b>100000</b>				
i i			127.2-132.2'-Sample.			
<b>!</b>	<b>—</b> 130 <b>—</b>		Recovered 5.0/5.0'=100%. RQD=3.2/5.0'=64%.		-	
			SILTSTONE: medium gray		-	
			(N 4/0); trace sand;			
	7		clayey; vertical and			
	- 1		horizontal calcite filled			
			fractures at 128.5-129.5'; carbonaceous fragments;			
	_1		bedding appears massive;		-	
	1		firm to hard; damp.			
	7		•			
	-1		132.2-137.7'-Sample.			
			Recovered 4.0/5.0'=80%.		7	
	_1		RQD=0.0/4.0'=0%. SILTSTONE: medium light		-	I
	125		gray (N 6/0); clayey;		_	
	<b>—</b> 135 <b>—</b>		sandy; interbedded layers			
<b>.</b>	- 1		of silty sandstone; very			
			<pre>fine-grained; tight; firm;</pre>		-	
			damp.		-	
			137.2-142.2'-Sample.	1	_	
	<b>1</b>		Recovered 5.0/5.0'=100%.			
	- 1		RQD=3.2/5.0'=64%.	1		
			137.2-138.0': SILTY		_	
			SANDSTONE: very fine-			
			grained; cemented with calcite.	[		ł
	71					ł
	140					<u> </u>
}		anawanana.				Alla.
Remai	rks	Logged by	: T. Gulliver & T. Murphy		Checked by:	TAKK

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Hydro-Search, Inc.

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Rocky Flats Plant

### LOG OF BORING NO.

48-86

Date Drilled 9/18/86, 9/19/86, 10/23/86 - 11/13/86 Coordinates N 36079.2 E 15168.7 Boring Method Casing Driver/NC Core Ground Surface Elevation 6079.68'

Bon	ng Men	casing i	river/NC core			
Elev. (feet)	Depth (feet)	Sample Graphic Type Log	Material Description	Penetration Resistance (Blows/Foot) 20 40	Water Content 20 40	Other Tests
	140		138.0-142.2': CLAYEY SILTSTONE: concretion layer at 138.2 to 138.8'; subvertical calcite vein at 139.0; firm; damp.  142.2-147.2'-Sample. Recovered 4.6/5.0'=93%. RQD=1.6/4.6'=35%. SILTSTONE: medium dark gray (N 4/0); trace sand; clayey; carbonaceous layers.  147.2-152.2'-Sample. Recovered 3.9/5.0'=78%. RQD=1.3/3.9'=33%. 147.2-151.3': SILTSTONE: same as above; firm; damp. 151.3-152.2': SANDSTONE: silty; laminations of siltstone; very fine- grained; convoluted bedding; 20°-30° dip; firm; damp.			
	155   -   -   -   -   -   -   -   -   -		152.2-157.2'- Sample. Recovered 4.3/5.0'=86%. RQD=1.2/4.3'=28%. 152.2-153.0': SILTY SANDSTONE: as above.  153.0-157.2': SILTSTONE: medium gray (N 5/0); clayey; trace sand; carbonaceous; firm; damp.  157.2-162.2'-Sample. recovered 3.4/5.0'= 68%. RQD=0.6/3.4'=18%. SILTSTONE: same as above; damp.			
Rema		Logged 1	ov: T. Gulliver & T. Murphy		Checked by	Pkk.

Logged by: T. Gulliver & T. Murphy

Checked by:

Rocky Flats Plant

# LOG OF BORING NO.

48-86

Date Drilled 9/18/86, 9/19/86, 10/23/86 - 11/13/86Coordinates N 36079.2 E 15168.7

Boring Method Casing Driver/NC Core Ground Surface Elevation 6079.68'

Boring Me	thod Casing I	Oriver/NC Core Ground Su	FIACE Elevation	JII 0077.00	
Elev. Dept (feet) (fee	h Sample Graphic	Material Description	Penetration Resistance (Blows/Foot) 20 40	Water Confent 20 40	Other Tests
160 - -		162.2-167.2'-Sample. Recovered 4.0/5.0'=80%. RQD=0.8/4.0'=20%. SILTSTONE: same as above; alternating layers of clayey siltstone and sandy siltstone; beds average 0.25' thick; appear to be close to horizontal; firm;			
165 170		damp.  167.2-173.0'-Sample. Recovered 1.0/6.0'=17%. RQD=0.0/1.0'=0%. SILTSTONE: medium dark gray (N 4/0); clayey; trace sand; abundant carbonaceous fragments; moderately firm; damp on fresh surface.		-	
<del></del> 175		173.0-178.0'=Sample. Recovered 4.3/5.0'=86%. RQD=3.4/4.3'=79%. SILTSTONE: same as above; damp.			
180 Remarks		178.0-183.0'-Sample. Recovered 4.0/5.0'=80%. RQD=1.2/4.0'=30%. SILTSTONE: same as above with coaly layer at 179.3' to 179.7'; highly fractured from 181.0-183.0'; firm; damp.  by: T. Gulliver & T. Murphy		Checked by	

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Rocky Flats Plant

## LOG OF BORING NO.

48-86

Date Drilled 9/18/86, 9/19/86, 10/23/86 - 11/13/86Coordinates N 36079.2

				river/NC Core Ground Su	rface Elevati	on 6079.68'	
Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/Foot) 20 40	Content Content 20 40	Other Tests
	180					_	
						_	
						-	
	_						
				183.0-187.0'-Sample. Recovered 2.7/4.0'=68%.		_	
				RQD=0.5/2.7'=19%.		-	
				SILTSTONE: same as above; clayey; highly fractured		-	
	185—			throughout; firm; damp.		i -	
	_						
	_			187.0-192.0'-Sample. Recovered 3.9/5.0'=78%.		_	
	_			RQD=0.0/3.9=0%. SILTSTONE: same as above;		-	
				less clay-rich; trace very fine-grained sand; coarser		-	
	_			silt; fractured; damp.			]
	_					] -	1
	_			192.0-197.0'-Sample. Recovered 4.2/5.0'=84%.		] -	-
	190			RQD=3.0/4.2'=71%. SILTSTONE: similar to	1	-	1
	- 150			above; coarser grained; less clay; trace very	1	-	1
	_			fine-grained sand; grades	1	]	1
	-			to interbedded silty sandstone and sandy	l	-	4
				siltstone at 194.5'; thin to thick bedded;		-	4
	_			highly convoluted contacts; abundant pene-		-	1
	_			contemporaneous deforma- tion chartacteristics;		-	
				bedding appears flat;			
				firm; damp to moist.			4
	195-			197.0-202.0'-Sample.			-
				Recovered 5.0/5.0'=100%. RQD=1.1/5.0'=22%.		-	1
	-			SANDSTONE: medium dark gray (N 4/0); fine to very			]
	_			fine-grained; silty, interbedded with siltstone			4
	_			and sandy siltstone; thin			-
	_			to thick bedded; convoluted; 50% sandstone;			1
	_	[		50% siltstone; firm to soft; wet.			]
	200				سييل		
Rema	arks	]	Logged b	y: T. Gulliver & T. Murphy		Checked by	1: SALT

Remarks

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## LOG OF BORING NO.

48-86

lev. D	epth Sa feet) Ty	mple Graphic pe Log	Material Description	Penetration Resistance (Blows/Foot) 20 40	Water Confent (%) 20 40	Other Tests
	200		202.0-207.0'-Sample. Recovered 4.6/5.0'=92%. RQD=2.8/4.6'=61%. SANDSTONE: medium light gray (N 6/0); very fine to medium-grained; poorly sorted; interbedded with siltstone and clayey siltstone; flaser bedding common; beds range from .001'to 1' in thickness; firm; wet.  207.0-212.0'-Sample. Recovered 4.2/5.0'=84%. RQD=0.9/4.2'=21%.  207.0-208.3': SANDSTONE: same as above.  208.3-212.0': SILTSTONE: dark gray (N 3/0); interbedded with medium gray (N 5/0); coaly; bedding is convoluted; appears horizontal.			
	215		TOTAL DEPTH: 212.0°			

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WELL	48-86	

				1		W	ELL -	40 00		
	6			1	WELL CONSTR	UCTION S	UMM	ARY		
				70	LOCATION or COORDS:	ELEVATION: GROUP	ND LEVEL		9.68'	
	1			7	N 36079.2 E 15168.7		F CASIN	<b>6</b> 08	32.37'	
	1			·						
1 1	25				DRILLING SUMMARY:	CONSTRUCTION	TIME	LOG:		
					TOTAL DEPTH Well: 207.07' Hole: 238.00'		. इत	ARI	FIN	<u>ISH</u>
				Mo.	BOREHOLE DIAMETER 0.00' - 78.30': 5 5/8"	TASK	DATE	TIME	DATE	TIME
				36.5	78.00' - 212.00': 4 3/4" 212.00' - 238.00': 4	DRILLING:	1986		1986	
	<b>-</b> 50		1		DRILLER Boyles Brothers Drilling Co.	5 5/8" casing advancer NC Core	9/18	1024	9/19	1110 1500
Murphy					15865 W. 5th Avenue, Golden, CO		10/23	1310 1500	10/28 11/13	1630
T.					(Tom High, Robert Roach)  0.00; - 78.30; Casing advancer; 78.30;  RIG - 78.00; Failing	Reaming	<u>11/13</u> —	<u>1300</u> _	<u> </u>	<del>-1050</del>
Ţ				6	RIG = 238.00': Failing  BIT(S) 0.00' - 78.30': Down hole hammer; 78.30'	GEOPHYS. LOGGING: CASING:				
ats ver	·			٤	BIT(s) 0.00' - 78.30 : Down to le namer, 70.30 - 212.00' : Coring bit; 212.00' - 238.00: Chop	5" steel	9/18	1024_	9/19	1110
Oulliver	<b>-</b> 75				POUL INC. 51 UID 0.00' - 78.30': None rod	2" stainless	11/14	0838	11/14	0900
{I .					prilling Fluip 0.00' - 78.30': None rod 78.30' - 238.00': Air/water mist to drill, benfonite mud to ream.	<del></del>				
	1				SURFACE CASING 5" x 78.4' steel w/ locking	FILTER PLACEMENT		1631	11/14	1342
						CEMENTING:	11/17	0857	11/18	1142
, <u>a</u>	-10				WELL DESIGN:	CEVELCPMENT:				
ERSONNEL	-				BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG	OTHER: Bentonite	11/14	1630	11/14	1645
PERSONN					CASING STRING(S): C=CASING S=SCREEN	Deliconice	11/13	1600	11/13	1631
	1			<b>%</b>	0.00' 78.40' C1	Packer testing	10/29	0730	11/3	1135
	_12				191.99'- 207.07' S1					
	<b> </b>	- 7								
						WELL DEVELOP	MENT			
						See Well Devel		S. emars	Sheet.	
						See Well Devel	Ophenic	Stiller y	GICCE.	
	-1	5 <b>c</b>			CASING: CI 5" I.D. steel surface casing					
					casing: C1 5 1.b. seeel surface C2 2" I.D. Sch. 5 type 316 stain					
					less steel, threaded and flush					
					jointed.					
,	-1	75			SCREEN: SI 2" I.D. Sch. 5 type 316 stain-					
777	1				less steel, threaded and flush jointed, 0.010" wire wrap	COMMENTS:				
3				<b></b>	screen, 0.25' welded bottom cap.	No water encou	ntered	during	drillin	g
1			-	<b>■</b>	CENTRALIZERS Type 304 stainless steel					
	$L_{2}$	o d			199.27' - 200.47'	Top of stainle	ss stee	l casir	ig: 2.6	9.
-			≣	1				•		
KOJECI			ΙΞ		FILTER MATERIAL 32-42 silica sand	Well built thr	ough 4"	casing		
5	Ì				188.50' - 209.00'  CEMENT Portland Type I					
	,	25			0.00' - 186.00'					
	<b>L</b> 2	_			OTHER 3/8" bentonite pellets					
					186.00' - 188.50'					
					209.00' - 238.00'					
	-2	50			HYDRO-SEARCH RENO-DENVER	CONSULTING H	YDROL	OGISTS	-GEOL	ogis-
	-				III DITA CEPITALINGO COME.					

Page No. 12/11/87 92

#### Water Level Data for Rockwell (Rocky Flats)

Date Measured	Depth to Water from TOC	Elevation TOC (ft)	Water Level Elev. (ft)		
	1				
** Well Number	r: 4886				
11/19/86	15.85	6082.37	6066.52		
11/20/86	154.67	6082.37	5927.70		
12/11/86	68.21	6082.37	6014.16		
12/12/86	150.00	6082.37	5932.37		
12/15/86	134.04	6082.37	5948.33		
12/16/86	150.00	6082.37	5932.37		
01/01/87	63.96	6082.37	6018.41		
02/01/87	59.29	6082.37	6023.08		
03/31/87	57.83	6082.37	6024.54		
05/06/87	64.02	6082.37	6018.35		
06/01/87	59.00	6082.37	6023.37		
07/08/87	69.65	6082.37	6012.72		
08/03/87	60.20	6082.37	6022.17		
08/24/87	58.70	6082.37	6023.67		
09/28/87	61.70	6082.37	6020.67		
11/02/87	<b>58.</b> 90	6082.37	6023.47		

#### INDEX OF DATA

Boring	No.: 49-86
Comple	ted as well? yes
Data in	File
X_	Log of Borehole
X_	Well Construction Summaries
	Well Development Summaries
	Hydraulic Conductivity Test Data
	and Results
	Packer Test Data and Results
	Water Level Data

LOG OF BORING NO. Project: Rocky Flats Plant Coordinates **Date Drilled** 10/16/86 N 36054.3 E 15169.3 Ground Surface Elevation 6079.831 Casing Driver Boring Method Penetration Resistance Other Tests Depth Sample Graphic (feet) Type Log Elev. Material Description (Blows/Foot) (feet) 20 20 40 ROCKY FLATS ALLUVIUM 0-7'-Cuttings. GRAVEL: moderate brown (5YR 4/4); silty; abundant quartzite; ).00. micaceous; 2% gravel limonite coated; dry. 7.0-13.0'-Cuttings. GRAVEL: Same as above with no limonite coatings; dry. 10. 13.0-16.0'-Cuttings. GRAVEL: moderate brown (5YR 4/4); silty; sandy; poorly sorted; subangular; 20-30% fines; damp. D.Co 16.0-26.0'-Cuttings. GRAVEL: moderate brown (5YR 4/4); silty; sandy; 10% silt; 30% sand; poorly sorted; subangular; moist. Remarks Checked by: Logged by: T. Gulliver Project No. Hydro-Search, Inc. 106P06222 Page 1 of 4

LOG OF BORING NO. 49-86 Project: Rocky Flats Plant Coordinates N 36054.3 Date Drilled 10/16/86 E 15169.3 Boring Method Casing Driver Ground Surface Elevation 6079.83' Penetration Resistance Water Content Other Depth Sample Graphic (feet) Type Log Elev. (feet) Tests Material Description (Blows/Foot) 20 20 20 26.0-32.0'-Cuttings. GRAVEL: moderate brown (5YR 4/4); silty; abundant boulders; 5% silt; moist. 30 . 32.0-38.0'-Cuttings. GRAVEL: Same as above; silt 5%; sand 10%; moist. اه و د 30 38.0-40.0'-Cuttings. GRAVEL: Same as above; fines <1%; dry. 40 Remarks Logged by: T. Gulliver Checked by >> Project No. Hydro-Search, Inc. 106P06222 Page 2 of 4

LOG OF BORING NO. Project: Rocky Flats Plant Coordinates **Date Drilled** 10/16/86 N 36054.3 E 15169.3 Ground Surface Elevation 6079.831 Boring Method Casing Driver Penetration Resistance Other Elev. Depth Sample Graphic (feet) (feet) Type Log Tests Material Description (Blows/Foot) 20 40 20 40 40.0-49.0'-Cuttings. GRAVEL: moderate brown (5YR 4/4); silty; sandy; poorly sorted; subangular; ፚ. silt 20%; sand 20-30%; moist. 49.0-50.0'-Cuttings. SAND: light brown (5YR 5/6); fine-grained; well sorted; subrounded; damp. 50.0-56.0'-Cuttings. GRAVEL: moderate brown (5YR 4/4); sandy; silty; gravel 10-20%; sand 20-30%; poorly sorted; subangular; moist. 55. 56.0-57.0'-Cuttings. GRAVEL: moderate brown (5YR 4/4); coarse, sandy gravel; moderately well sorted; rounded; wet. 57.0-64.0'-Cuttings. GRAVEL: moderate brown (5YR 4/4); silty; sandy; silt 10%; coarse to medium-grained sand 20-30%; subrounded; wet. Remarks Checked by: Logged by: T. Gulliver Project No. Hydro-Search, Inc. Page 3 of 4 106P06222

LOG OF BORING NO. Project: Rocky Flats Plant Coordinates N 36054.3 E15169.3 **Date Drilled** 10/16/86 Ground Surface Elevation 6079.83' Boring Method Casing Driver Penetration Resistance Content Other Elev. Depth Sample Graphic (feet) (feet) Type Log Tests Material Description (Blows/Foot) 40 20 40 20 0° 64.0-66.0'-Cuttings. GRAVEL: moderate brown (5YR 4/4); sandy; silty; fine to medium-grained sand 20%; silt 30%; wet. 66.0-67.0'-Cuttings. GRAVEL: moderate brown (5YR 4/4); silty; sandy; 20% gravel; 30% mediumgrained sand; poorly sorted; very wet. 67.0-67.5'-Cuttings. CLAY: moderate brown (5YR 4/4); sandy; silty; plastic; soft; wet. 67.5-68.0'-Cuttings. SAND: moderate brown (5YR 4/4); gravelly; silty 5%; LARAMIE FORMATION 68.0-69.0'-Cuttings. CLAYSTONE: light olive gray (5Y 5/2); subplastic; damp. 69.0-70.0'-Cuttings. SILTSTONE: light olive gray (5Y 5/2); subplastic; damp. 70.0-74.0'-Cuttings. CLAYSTONE: medium gray (N 5); laminated; damp. TOTAL DEPTH: 74.0' Checked by: Remarks Logged by: T. Gulliver Project No. Hydro-Search, Inc. 106P06222 Page 4 of 4

WEL	49-86	
WEL		

		$\mathbf{x}$		W	ELL _	49-00		
	-0	<b>%</b> 2	WELL CONSTR	RUCTION S	UMM	ARY		
	:22s	n q	LOCATION or COORDS:	ELEVATION: GROUP	ND LEVEL		32.15'	<del></del>
	▓≣	8	N 36054.3 E 15169.3		F CASIN		79.83 <b>'</b>	
	∭≣	, g						
1 1	<b>⊣</b> ∘ ∭		DRILLING SUMMARY:	CONSTRUCTION	TIME	LOG:		
		ρ.	TOTAL DEPTH Well: 67.60' Hole: 74.00'		ST	ART	FIN	ISH
		H.°	BOREHOLE DIAMETER 5 5/8"	TASK	DATE	TIME	<u>DATE</u> 1986	TIME
11		P.	BUREHOLE DIAMETER	DRILLING:	<u>DATE</u> 1986		1986	
		<b>.</b>	DRILLER Boyles Brothers Drilling Co.	5 5/8" casing advancer	<u>10/16</u>	0900	10/16	1515
	20	• .0	15865 W. 5th Avenue, Golden, CO	advancer				
		29	(Arrow Drilling, Tom High)					
	₩≣		RIG <u>Casing advancer</u>	GEOPHYS. LOGGING:		_=_		
8 8	▓≣	Þď	BIT(S)Down hole hammer	CASING:  2" stainless	10/17	1230	10/17	1246
י וריי (	-30 💹 🧮	0	Vers	2 Stanness	10/1/	1250	107 17	
Colden. T. Gull		0.000	DRILLING FLUID None	<del></del>				
3 ∺		o l	oupsies casing 5" x 4.40' steel w/ locking	FILTER PLACEMENT:	10/17	1250	10/20	0900
	∭≣	b°l	SURFACE CASING 5" x 4.40' steel w/ locking	CEMENTING:	10/17	1000	10/17	1100
	40	O	WELL DESIGN:	CEVELOPMENT:				
OF NO	~ ₩≣	ાં ન્યુ	BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG	OTHER:				
LOCATION		0	CASING STRING(S): C=CASING S=SCREEN	Bentonite	10/17		10/17	1246
<u>ہ</u> د		βd	<u>0.00' 4.10' C1  </u>		10/20	0920	<u>10/20</u>	0925
		0°	<u>4.10' - 67.60' SI </u>	<del></del>				<del></del>
	F ₅₀ ∭ ≣							
1 1	▓≣	13						
1 1	1	lo l		WELL DEVELOF	PMENT			
		1).0		See Well Develo	opment :	Summary	Sheet.	
		3						
			CASING: CI 2" I.D. Sch. 5 type 316 stain-					
		5.4	less steel, threaded and flush					
Plant	░≣	29	jointed.					
PI S	=		216					
106P06222 Rocky Flats	- ₇₀		SCREEN: SI 2" I.D. Sch. 5 type 316 stain- less steel, threaded and flush					
106P06222 Rocky Fla		目	iointed, 0.010" wire wrap screen,	COMMENTS:				
		-	0.25' welded bottom cap.	Water encounter	red at	52' dur	ing dril	ling.
			CENTRALIZERS Type 304 stainless steel					
			58.80' - 60.05'	Top of stainle	ss stee	l casin	2: 2.32	<del>'</del>
-	<b>-8</b> 0				······			
JEC			FILTER MATERIAL 32-42 silica sand					
PROJECT			3.57' - 69.00'					
_ '			O.00' - 2.40'					
	-90		OTHER 3/8" bentonite pellets					
			2.40' - 3.57'					
:			69.00' - 74.00'	<del></del>		,		
	- 100		UVDDO_SEARCH assumes NASH	CONSULTING H	YDRO! (	OGISTS	-GEOL	OGISTS

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#### Water Level Data for Rockwell (Rocky Flats)

Date Measured	Depth to Water from TOC	Elevation TOC (ft)	Water Level Elev. (ft)		
** Well Numbe	r: 4986				
11/19/86	46.87	6082.15	6035.28		
11/21/86	48.35	6082.15	6033.80		
11/24/86	49.00	6082.15	6033.15		
01/01/87	49.46	6082.15	6032.69		
02/01/87	49.50	6082.15	6032.65		
03/31/87	49.02	6082.15	6033.13		
05/06/87	47.15	6082.15	<b>6035.</b> 00		
06/01/87	45.27	6082.15	6036.88		
07/08/87	41.40	6082.15	6040.75		
08/03/87	54.00	6082.15	6028.15		
08/24/87	44.00	6082.15	6038.15		
09/28/87	44.90	6082.15	6037.25		
11/02/87	44.60	6082.15	6037.55		

#### INDEX OF DATA

Boring	No.: 50-86	 
Comple	ted as well?yes	
Data in	File	
<u>x</u> _	Log of Borehole	
X_	Well Construction Summaries	
X	Well Development Summaries	
	Hydraulic Conductivity Test Data	
	and Results	
	Packer Test Data and Results	
X_	Water Level Data	

LOG OF BORING NO. Project: Rocky Flats Plant 50-86 10/7/86 Coordinates N 34881.1 Date Drilled E 14170.8 Casing Driver **Ground Surface Elevation** Boring Method 6103.95 Penetration Resistance Other Tests Depth Sample Graphic (feet) Type Log Material Description (Blows/inch) 20 40 ROCKY FLATS ALLUVIUM 0-12.0'-Cuttings. GRAVEL: moderate brown (5YR 4/4); 0 granite and quartzite pebbles, cobbles, and .00 boulders; <2% sand and % silt; iron coated surfaces; poorly sorted; 0.0 12.0-14.0'-Cuttings. 000 GRAVEL: Same as above; damp. 14.0-15.0'-Cuttings. SAND: moderate brown (5YR 4/4); very fine-grained; 1% mica; moderate sorting; subangular; unconsolidated; damp. 15.0-25.0'-Cuttings. GRAVEL: moderate brown (5YR 4/4); granite and quartzite pebbles, cobbles and boulders; some boulders >2' in diameter; 1-2% sand and silt; poorly sorted; unconsolidated; dry.

Remarks

Logged by: T. Gulliver

Checked by:

Project No.

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Hydro-Search, Inc.

Page 1 of 6

LOG OF BORING NO. Project: Rocky Flats Plant 50-86 10/7/86 Coordinates N 34881.1 E 14170.8 **Date Drilled** 6103.95 Casing Driver **Ground Surface Elevation Boring Method** Penetration Resistance Other Depth Sample Graphic (feet) Type Log Tests Elev. **Material Description** (Blows/Inch) 20 40 20 25.0-25.5'-Cuttings. GRAVEL: moderate brown (5YR 4/4); granitic pebbles; sandy; silty; poorly sorted; unconsolidated; damp. 25.5-75.0'-Cuttings. GRAVEL: moderate brown (5YR 4/4); granitic pebbles and cobbles with some light gray (N 7)
quartzite cobbles; 1-5\$ sand and silt; poorly sorted; unconsolidated; 000 damp.

Remarks

Logged by: T. Gulliver

Checked by:

Project No. 106P06222

Hydro-Search, Inc.

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LOG OF BORING NO. Project: Rocky Flats Plant 50-86 10/7/86 E 14170.8 **Date Drilled** Coordinates N 34881.1 Casing Driver **Boring Method Ground Surface Elevation** 6103.95 Penetration Resistance Other Depth Samue Graphic (feet) Type Log Tests **Material Description** (Blows/Inch) 20 40 40 Remarks Logged by: T. Gulliver Checked by: Project No. Hydro-Search, Inc. 106P06222 Page 3 of 6

LOG OF BORING NO. Project: Rocky Flats Plant 50-86 Coordinates N 34881.1 10/7/86 **Date Drilled** E 14170.8 **Ground Surface Elevation** 6103.95 **Boring Method** Casing Driver Penetration Resistance Other Depth Sample Graphic (feet) Type Log Tests **Material Description** (Blows/Inch) 20 40 75.0-92.0'-Cuttings. GRAVEL: moderate brown (5YR 4/4); granitic pebbles and cobbles; 20% medium to coarse-grained sand and silty sand;
poorly sorted; subangular; unconsolidated; damp. Remarks Checked by: Logged by: T. Gulliver Project No. Hydro-Search, Inc. 106P06222 Page 4 of 6

LOG OF BORING NO. Project: Rocky Flats Plant 50-86 Coordinates N 34881.1 **Date Drilled** 10/7/86 **Ground Surface Elevation** 6103.95 Boring Method Casing Driver Penetration Resistance Other Depth Sample Graphic (feet) Type Log Tests **Material Description** (Blows/Inch) 20 40 80 92.0-98.0'-Cuttings. GRAVEL: Same as above; wet. LARAMIE FORMATION 98.0-102.0'-Cuttings. CLAYSTONE: very light gray (N 8); plastic; laminated; moist. 100 Checked by: Remarks Logged by: T. Gulliver Project No. Hydro-Search, Inc. Page 5 of 6 106P06222

LOG OF BORING NO. Project: 50-86 Rocky Flats Plant Coordinates N 34881.1 10/7/86 **Date Drilled** Boring Method Casing Driver **Ground Surface Elevation** 6103.95 Penetration Resistance Other Tests Depth Sample Graphic (feet) Type Log Elev. (feet) **Material Description** (Blows/Inch) 20 40 100 TOTAL DEPTH: 102.0' Checked by Remarks Logged by: T. Gulliver Project No. Hydro-Search, Inc. Page 6 of 6 106P06222

WELL	50-86	

	٠	1	1111	≣	Ô	WELL CONSTR	RUCTION S	UMM	IARY	,	
					₽,	LOCATION or COORDS:				03.95'	
				≣	5	N 34881.1 E 14170.8	TOP	F CASIN	G	.05.14 <b>'</b>	
	1 1	1 20			ě	DRILLING SUMMARY:	CONSTRUCTION	TIME	LOG:		
					ß.	TOTAL DEPTH Well: 96.15' Hole: 102.00'		<u>\$1</u>	ART	FIN	ISH
					þ.	BOREHOLE DIAMETER 0.00' - 37.00': 5 5/8"	TASK DRILLING:	<b>DATE</b> 1986	TIME	<u>DATE</u> 1986	TIME
		40			ja Je	DRILLER Boyles Brothers Drilling Co.	5 5/8" & 5" casing advance	10/7	0820	10/7	1400
					Drop's	15865 W. 5th Avenue, Golden, CO (Arrow Drilling, Tom High)		<b> </b> -			
					6	RIG Casing advancer	GEOPHYS. LOGGING:				
8	, ,				10	BiT(S) Down hole hammer	CASING:				
		60			76	DRILLING FLUID None	2" stainless	10/14	1052	10/14	1105
Colden	đ				5.	DRILLING FLUID None	<del></del>				
ح					60	SURFACE CASING 5" x 4.13' steel w/ locking	FILTER PLACEMENT	10/14	1200	10/14	1440
	یا ا				కి.	WELL DESIGN:	CEMENTING:	10/14	1450	10/14	1500
2	N N	-80			2		DEVELOPMENT:	10/23	1355	10/31	1045
MOTATON	ERSONNEL				.00	BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG CASING STRING(S): C=CASING S=SCREEN	OTHER: <u>Bentonite</u>	10/14	1440	10/14	144 1
-	ים נ				0	0.00' 2.90' C1			<del></del>		
						2.90' - 96.15' S1					
		100		ja és,							
							WELL DEVELOP	MENT			
							See Well Develo		***************************************	Shoot	
							See Well Develo	pient 3	unuary	Meet.	
		120	)			CASING: CI 2" I.D. Sch. 5 type 316 stain-					
						less steel, threaded and flush	<del></del>			<del></del>	
	Plan					jointed.					
	or.	140	)			SCREEN: SI 2" I.D. Sch. 5 type 316 stain-					
106P06222	Rocky Flat					less steel, threaded and flush	COMMENTS:				
)6P0	Cky					jointed, 0.010" wire wrap screen, 0.25' welded bottom cap.	Water encounter	ad at 4	ا ما ا	na drill	ina
$\simeq$	잗	1				CENTRALIZERS Type 304 stainless steel	water encounter	eu ac 4.	o dari	ng utiti	1118.
		_160	)			85.71' - 86.95'	Top of stainles	s steel	casing	:1.19'	
5						92.93' - 94.10'		•			·
PROJECT						FILTER MATERIAL 16-40 silica sand 2.40' - 96.15'	Cave from TD to	95.15'		<del></del>	
ā	ı					CEMENT Portland Type I					
		180	)			0.00' - 1.60'			·		
						OTHER 3/8" bentonite pellets 1.60' - 2.40'					
						1.00 - 4.40		· <u> </u>			
		- 200	)		1 1	HYDDO SEADOU				A 2 6 : -	
	ı					HYDRO-SEARCH RENO*DENVER	CONSULTING HY	DROLO	GISTS-	GEOLO	GISTS

WE	11	50-86	
W E			

#### WELL DEVELOPMENT SUMMARY

DATE	TIME	METHOD	VOLUME	APPEARANCE	COMMENTS
	1055				<pre>! Well Bore Volume = 7.86 gals. ! Well Bore Volumes = 78.6 gals.</pre>
10-23-86	1355			34 11 1 1 1 1	10 Well bore volumes - 70.0 gars.
10-23-86	1355	Airlifted	7.8 gals.	Medium to dark brown	
10 23 50	.555		8	Medium to dark	
10-24-86	1150	Airlifted	7.8 gals	brown spray	<del>_</del>
10-27-86	1440	Bailed	24 gals.	Medium to dark brown, trace oily sheen	24/78.6 gals. purged to date
10-28-86	1445	Bailed	l6 gals.	Medium reddish brown, slightly turbid	40/78.6 gals purged to date
10-29-86	0900	Bailed	24 gals.	Medium to dark brown, no signi- ficant change	64/78.6 gals. purged to date
10-31-86	0840	Bailed	22 gals.	Medium brown - highly turbid	86/78.6 gals. purged to date
10-31-86	1045	Bailed	_	Medium brown - slightly turbid	Sampled
		·			

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#### Water Level Data for

Rockwell (Rocky Flats)

Date Measured	Depth to Water from TOC	Elevation TOC (ft)	Water Level Elev. (ft)		
** Well Numbe	r: 5086				
10/23/86	49.50	6105.14	6055.64		
10/27/86	49.25	6105.14	6055.89		
10/28/86	49.46	6105.14	6055.68		
10/31/86	49.35	6105.14	6055.79		
11/26/86	49.32	6105.14	6055.82		
01/01/87	49.33	6105.14	6055.81		
03/31/87	49.52	6105.14	6055.62		
05/06/87	49.08	6105.14	6056.06		
05/01/87	47.65	6105.14	6057.49		
07/08/87	47.00	6105.14	6058.14		
08/03/87	47.60	6105.14	6057.54		
08/14/87	46.40	6105.14	6058.74		
09/28/87	46.50	6105.14	6058.64		
11/02/87	46.00	6105.14	6059.14		

#### **INDEX OF DATA**

Boring	No.: 51-86
Comple	ted as well? yes
Data in	File
<u>X</u>	Log of Borehole
<u> </u>	Well Construction Summaries
<u> </u>	Well Development Summaries
	Hydraulic Conductivity Test Data
	and Results
	Packer Test Data and Results
X	Water Level Data

LOG OF BORING NO. Project: Rocky Flats Plant **Date Drilled** 10/22/86 Coordinates N 35683.1 E 13014.5 Ground Surface Elevation 6123.99' Casing Driver **Boring Method** Penetration Resistance Other Elev. Depth Sample Graphic (feet) (feet) Type Log Tests Material Description (Blows/Foot) 40 20 40 20 ROCKY FLATS ALLUVIUM 0-5.0'-Cuttings. GRAVEL: moderate brown (5YR 4/4); sandy; 10-20% sand; poorly
sorted; limonitic; dry. 5.0-17.0'-Cuttings. GRAVEL: Same as above; abundant quartzite 0 boulders; dry. 10 17.0-20.0'-Cuttings. GRAVEL: moderate brown (5YR 4/4); sandy; silty; 10% sand; 20-30% gravel; damp. Checked by Remarks Logged by: T. Gulliver Project No. Hydro-Search, Inc. 106P06222 Page 1 of 5

LOG OF BORING NO. Project: Rocky Flats Plant Coordinates N 35683.1 E 13014.5 **Date Drilled** 10/22/86 Ground Surface Elevation 6123.99' Boring Method Casing Driver Penetration Resistance Other Depth Sample Graphic (feet) Type Log Tests Material Description (Blows/Foot) (feet) 20 20.0-22.0'-Cuttings. SAND AND GRAVEL: moderate brown (5YR 4/4); poorly sorted; subangular; gravel 40%; damp. 000 22.0-28.0'-Cuttings. GRAVEL: moderate brown (5YR 4/4); sandy; silty; 10-20% sand; poorly 000 sorted; subangular; moist. 25 28.0-30.0'-Cuttings. CLAY: moderate brown (5YR 4/4); 10-20% gravel; 30 plastic; wet. 30.0-32.0'-Cuttings. SAND: moderate brown (5YR 4/4); 5% gravel; silty; poorly sorted; subangular; 32.0-38.0'-Cuttings. SILT: moderate brown (5YR 4/4); sandy; gravelly; 20% sand; moderate sorting; subrounded; 20-30% gravel; 35. 38.0-45.0'-Cuttings. SAND: light brown (5YR 5/6); fine-grained; 5% gravel; moderate sorting; subrounded; dry. Remarks Checked by: 9 Logged by: T. Gulliver Project No. Hydro-Search, Inc. 106P06222 Page 2 of 5

LOG OF BORING NO. Project: Rocky Flats Plant 51-86 Coordinates N 35683.1 E 13014.5 **Date Drilled** 10/22/86 Ground Surface Elevation 6123.99' Boring Method Casing Driver Penetration Resistance Other Elev. (feet) Depth Sample Graphic (feet) Type Log Tests Material Description (Blows/Foot) 20 20 40 45.0-55.0'-Cuttings. BOULDER GRAVEL: pale yellowish brown (10YR 6/2); abundant quartzite and quartz sandstone; dry. 55.0-74.0'-Cuttings. BOULDER GRAVEL: same as above; silty; damp. Remarks Checked by: Logged by: T. Gulliver Project No. Hydro-Search, Inc. 106P06222 Page 3 of 5

LOG OF BORING NO. Project: Rocky Flats Plant 10/22/86 Coordinates N 35683.1 E 13014.5 Date Drilled Casing Driver Ground Surface Elevation Boring Method 6123.99' Penetration Resistance Content Other Tests Elev. Depth Sample Graphic (feet) (feet) Type Log Material Description (Blows/Foot) 20 40 20 60 Doo 70-74.0-78.5'-Cuttings. CLAY: moderate brown (5YR 4/4); sandy; silty; subplastic; damp. LARAMIE FORMATION 78.5-81.0'-Cuttings. CLAYSTONE: light brown (5YR 5/6); silty; damp. 80 Remarks Logged by: T. Gulliver Checked by: Project No. Hydro-Search, Inc. Page 4 of 5 106P06222

LOG OF BORING NO. Project: Rocky Flats Plant Coordinates N 35683.1 E 13014.5 **Date Drilled** 10/22/86 Casing Driver Ground Surface Elevation **Boring Method** 6123.99' Penetration Resistance Other Tests Elev. Depth Sample Graphic (feet) (feet) Type Log Material Description (Blows/Foot) 20 40 80 81.0-94.0'-Cuttings. SILTSTONE: light olive brown (5YR 5/6); minor claystone; damp. 94.0' TOTAL DEPTH: Remarks Checked by: Logged by: T. Gulliver Project No. Hydro-Search, Inc. 106P06222 Page 5 of 5

WELL	51 <del>-</del> 86	

	-0			WELL CONSTR	CUCTION S	UMM			
				LOCATION or COORDS:	ELEVATION: GROUP TOP 0	ND LEVEI F CASIN	61	23.99' 26.51'	
۱	-10		000	DRILLING SUMMARY:	CONSTRUCTION	TIME	LOG:		
l			1	TOTAL DEPTH Well: 79.06' Hole: 94.00'	TASK	[	ART I		ISH
				BOREHOLE DIAMETER 5 5/8"	DRILLING:	1986	TIME	<b>DATE</b> 1986	TIME
	-20		0	DRILLER Boyles Brothers Drilling Co.  15865 W. 5th Avenue, Golden, CO	5.5/8" casing advancer	_10/22	<u>0830</u>	_10/22	1700
		Ξ	C	(Arrow Drilling, Tom High) Casing advancer	GEOPHYS. LOGGING:				
Gulliver			S O	RIG Casing advancer  BIT(S) Down hole hammer	CASING:  2" stainless	10/23	1150	10/23	1200
T. Gul	<b>-</b> 30		P	DRILLING FLUID None					
				SURFACE CASING 5" x 5.4' steel w/ locking	FILTER PLACEMENT:	10/23	1200	10/23	1430
Ē		≣	ĥ.	WELL DESIGN:	CEMENTING: LEVELOPMENT:	10/23 10/27	1505 1230	10/23 11/7	1510 1420
PERSONNEL	F 40	≣		4	OTHER:				
PER				CASING STRING(S): C=CASING S=SCREEN  0.00' 4.83' C1	Bentonite	10/23 10/23	1440 1050	10/23 10/23	1445 1150
			7:00	4.83'- 79.06' SI			1050		
	- 50		6						
			100			MENT			
			Po		See Well Develo		i mmarar	Sheet	
					See Well Develo	phene c	dinary	Sheet.	
	- 6Q		0	CASING: C1 2" I.D. Sch. 5 type 316 stain-					
닐	1		þ.	c2 less steel, threaded and flush c3 jointed.		<u> </u>			
Plant	1000		6	C4					
Kocky Flats	<b>-</b> 70		o o	SCREEN: SI 2" I.D. Sch. 5 type 316 stain- s2 less steel, threaded and flush					
ğ	THE STATE OF			S3 Jointed, 0.010 Wife Wrap Screen,	COMMENTS:				
\$	Taraba a		0,	S4 0.25' welded bottom cap.  CENTRALIZERS Type 304 stainless steel	No water encour	ntered o	during o	drilling	<u>-</u>
	- 80		Ē	72.58' - 73.82'	Top of stainles	s stee	casin	2.5	2'
				FILTER MATERIAL 32-42 silica sand	Cave from TD to	85'			
ij				4.00' - 80.30'  CEMENT Portland Type I					<del></del>
	-90			0.00' - 3.10'					
				отнея <u>3/8" bentonite pellets</u> 			.,		
		 		80.30' - 85.00'					
t	100			HYDRO-SEARCH RENO*DENVER	CONSULTING HY	DROLO	GISTS-	GEOLO	GISTS

#### WELL DEVELOPMENT SUMMARY

DATE	TIME	METHOD	VOLUME	APPEARANCE	COMMENTS
10-27-86	1230				<pre>1 Well Bore Volume = 3.76 gals. 10 Well Bore Volumes = 37.6 gals.</pre>
10-27-86	1230	Airlifted	3.76 gals.	Light brown spray	_
10-30-86	1525	Bailed	7 gals.	Light brown, slightly turbid	7/37.6 gals. purged to date
11-3-86	1105	Bailed	9.5 gals.	Light brown, slightly turbid	16.5/37.6 gals. purged to date
11-5-86	1055	Bailed	9.5 gals.	Light brown, slightly turbid	26/37.6 gals. purged to date
11-6-86	1341	Bailed	9.0 gals.	Light gray, slightly turbid	35/37.6 gals. purged to date
11-7-86	1420	Bailed	_	Clear	Sampled
				·	
					•
			· .		
				,	

Page No. 12/11/87 95

#### Water Level Data for Rockwell (Rocky Flats)

Date Measured	Depth to Water from TOC	Elevation TOC (ft)	Water Level Elev. (ft)		
** Well Numbe	r: 5186				
10/27/86	58.17	6126.51	6068.34		
10/29/86	52.89	6126.51	6073.62		
10/30/86	47.50	6126.51	6079.01		
11/03/86	55.83	6126.51	<b>6070.68</b>		
11/05/86	60.73	6126.51	6065.78		
11/06/86	61.88	6126.51	6064.63		
11/07/86	61.10	6126.51	6065.41		
11/26/86	60.88	6126.51	6065.63		
01/91 <b>/87</b>	62.69	6126.51	6063.82		
02/23/87	61.60	6126.51	6064.91		
03/31/87	56.85	6126.51	6069.66		
05/06/87	53.75	6126.51	6072.76		
06/01/87	46.90	6126.51	6079.61		
07/08/87	47.50	6126.51	6079.01		
08/03/87	50.00	6126.51	6076.51		
08/19/87	50.80	6126.51	607571		
C9/28/87	77.50	6126.51	6049.01		
11/02/87	58.90	6126.51	6067.61		

#### INDEX OF DATA

Boring	No.: 52-86
Comple	ted as well? yes
Data in	File
X_	Log of Borehole
X_	Well Construction Summaries
	Well Development Summaries
	Hydraulic Conductivity Test Data
	and Results
	Packer Test Data and Results
X	Water Level Data

Project: LOG OF BORING NO. 52-86 Rocky Flats Plant 10/20/86 and 11/17/86 to 11/20/86 Coordinates x 35714.8 E 13010.8 **Date Drilled** Boring Method Ground Surface Elevation 6124.00' Casing Driver/NC Core Penetration Resistance Other Elev. Depth Sands Graphic (feet) (feet) Type Log Material Description Tests (Blows/Foot) 20 40 20 40 ROCKY FLATS ALLUVIUM 0-7.0'-Cuttings. GRAVEL: moderate brown :O.º (5YR 4/4); 20% sand; 0.0 limonitic; poorly sorted; angular; dry. 7.0-16.0'-Cuttings. GRAVEL: moderate brown (5YR 4/4); 20% milt; poorly sorted; angular; dry to damp. Perched water table at 12.0'. 16.0-20.0'-Cuttings. GRAVELLY SANDY SILT: moderate brown (5YR 4/4); silty; 20% gravel; 30% sand; angular; moist. 20 Remarks Logged by: T. Gulliver and T. Murphy Checked by: Project No. Hydro-Search, Inc. 106P06222 Page 1 of 8

Project: LOG OF BORING NO. 52-86 Rocky Flats Plant 10/20/86 and 11/17/86 to 11/20/86 Coordinates N 35714.8 E 13010.8 **Date Drilled** Ground Surface Elevation 6124.00' Boring Method Casing Driver/NC Core Penetration Resistance Other Elev. Depth Sample Graphic (feet) (feet) Type Log Material Description Tests (Blows/Foot) 20 20 40 40 20 20.0-22.0'-Cuttings. GRAVELLY SAND: moderate yellowish brown (10YR 5/4); poorly sorted; subangular; moist. 22.0-29.0'-Cuttings. GRAVELLY SILTY SAND: Same as above; 30% gravel; wet. 29.0-30.0'-Cuttings. CLAY: moderate yellowish brown (10YR 5/4); 10-20% gravel; plastic; moist. 30.0-32.0'-Cuttings. SAND: moderate brown (5YR 4/4); silty and gravelly; 20% gravel; 30% sand; subangular; damp. 32.0-33.0'-Cuttings. GRAVELLY SANDY SILT: 000 moderate brown (5YR 4/4); 20-40% boulders; poorly sorted; damp. 00.0 35 33.0-57.0'-Cuttings. GRAVEL: moderate yellowish brown (10YR 5/4); abundant quartzite, sandstone and pink granitoids; sandy; poorly sorted; subangular; damp. Remarksc Logged by: T. Gulliver and T. Murphy Checked by: Project No. Hydro-Search, Inc. 106P06222 Page 2 of 8

			y Flats Plant LOG OF BORI			NG NO.	
	e Drille ing Met		86 and 11/17/86 to 86 ng Driver/NC Core	Coordinat Ground S	35714.8 ينج urface Elevat	E 13010.8	
Elev. (feet)	Depth (feet)	Sample Graph Type Log	Material Descri	iption	Penetration Resistance (Blows/Foot) 20 40	Content Content 20 40	Other Tests
	40 45 45 45 45 45 45 45 45 45 45 45 45 45		57.0-59.0'-Cutting GRAVEL: moderate (5YR 4/4); abundary quartzite and sar boulders; poorly subangular; damp.	e yellow- 5/4); ; sub- ngs. b brown ant ndstone sorted:			
Remark		Logged b	y: T. Gulliver and	T. Murphy		Checked by:	
Project	t No. 106P06222		Hydro-Se	earch, l	nc.	Page 3 of 8	

Project: LOG OF BORING NO. Rocky Flats Plant 52-86  $\frac{10/20/86}{11/20/86}$  and  $\frac{11}{17/86}$  to Coordinates N. 35714.8 E 13010.8 **Date Drilled** Boring Method Ground Surface Elevation 6124,00' Casing Driver/NC Core Penetration Resistance Other Depth Sample Graphic (feet) Type Log Material Description Tests (Blows/Foot) 40 20 69.0-70.0'-Cuttings. GRAVEL: moderate brown (5YR 4/4); silty; poorly sorted; subangular; damp. 70.0-72.0'-Cuttings. CLAY: grayish brown (5YR 3/2); sandy; carbon and mica common; plastic; damp. LARAMIE FORMATION 72.0-76.0'-Cuttings. CLAYSTONE: light olive brown (5Y 5/6) to light 75 olive gray (5Y 5/6); plastic to subplastic; damp. 76.0-80.0'-Cuttings. CLAYSTONE AND SILTSTONE: light olive gray (5Y 5/6); interbedded; subplastic; T. Gulliver and T. Murphy Remarks Logged by: Checked by: Project No.

Hydro-Search, Inc.

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106P06222

Rocky Flats Plant

#### LOG OF BORING NO.

52-86

Date Drilled

 $\frac{10/20/86}{11/20/86}$  and  $\frac{11}{17/86}$  to

Coordinates 35714.8 E 13010.8

Ground Surface Elevation 6124.00' **Boring Method** Casing Driver/NC Core Penetration Resistance Other Tests Depth Sample Graphic (feet) Type Log Elev. Material Description (Blows/Foot) 20 20 TTT80.0-88.0'-Cuttings. SILTSTONE AND CLAYSTONE: dusky yellow (5Y 6/4); nonplastic; damp. 88.0-93.0'-Sample. Recovered 4.0/5.0'=80%. RQD=2.0/4.0'=50%. SILTSTONE: yellowish gray (5Y 7/2) stained in bands; dark yellowish orange (10YR 6/6); sandy; trace clay; beds 1-3" thick of silty sandstone; apparent dip of 10-15°; iron nodules present; soft; damp. 93.0-98.0'-Sample. Recovered 1.7/5.0'=34%. RQD= 1.7/1.7'=100%. CLAYSTONE: light olive 95 gray (5Y 5/2); stained along fractures moderate yellow (5Y 7/6); trace silt; bedding dipping 15-20°; some bedding plane fractures with iron stains; also present subvertical fractures; some stained; soft; damp. Logged by: T. Gulliver and T. Murphy Checked by: Remarks

Project No. 106P06222

Hydro-Search, Inc.

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Rocky Flats Plant

#### LOG OF BORING NO.

Date Drilled Boring Method

 $\frac{10/20/86}{11/20/86}$  and  $\frac{11/17/86}{11}$  to

Casing Driver/NC Core

Coordinates 35714.8 E 13010.8 Ground Surface Elevation 6124.00'

	ing met		Casing	Driver/NC Core Ground S	Uliaca Elevati	6124.00	
Elev. (feet)	(feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/Foot) 20 40	Content 20 40	Other Tests
	100			98.0-101.5'-Sample.			
	-			Recovered 2.7/3.5'=77%. RQD=0.6/2.7'=22%.		4	
				CLAYSTONE: light olive			
				gray (5Y 5/2) grading to		_	
Ī	_			grayish red (5R 4/2) to			
I				yellowish gray (5Y 4/2);		٦	
				highly fractured and stained; iron stained		4	
•				fractures are subvertical		4	'
1				60°; lower portion of core			,
- 1	4			becoming more silty.		4	
L	105			101.5-106.5'-Sample.	1		
ı	لے ```			Recovered 0.4/5.0'=8%			
	7			RQD=0/0.4'=0%.	1		
	7			SANDSTONE: light gray (N			
				7/0); medium to very fine-		_	
	4			grained; 10-20% mafics; mostly quartz; silica		4	
	L			cement; hard; damp to wet.			
ı	7			_		7	
I	7			106.5-108.5'-Sample.	1	4	
	1	•		Recovered 0.0/2.0'=0%.			
	- 4					4	
1	J			108.5-111.5'-Sample.			
	7			Recovered 0.8/3.0'=27%.			1
	110			RQD=0.0/0.8'=0%.	]	4	
I				SANDSTONE: same as 101.5-	Ī		
1				106.5' with dark yellowish orange stained siltstone	i	4	
1	ال ا			(10YR 6/6) interbedded			
				with sandstone; medium to			
- 1				fine-grained; very silty;		4	
I	4			cross-bedded; hard; damp.	] [	4	
j	4				l I		•
ł				111.5-114.5'-Sample.	į į	_1	1
	7			Recovered 1.0/3.0'=33%.	1	7	
	7			RQD=0.0/3.0'=0%.		4	•
ł	4			SANDSTONE: same as above; light gray stained in		4	
<u> </u>	115			band; dark yellowish	1	1	
•	L			orange (at high angles 60-	] [	1	•
	7			70°); very silty and		7	
ł	7			clayey; bedding appears to	]	4	
	4			be similiar to staining; soft; damp to wet.		4	
	_			wamp to wet.		4	•
1	1				1		•
1					1	7	
	7					4	•
	-						
j	-					4	•
I						_ ]	
	120						
emark	8	Log	ged by:	T. Gulliver and T. Murphy		Checked hw: N	AP

Logged by: T. Gulliver and T. Murphy

Checked by:

Project No. 106P06222

Hydro-Search, Inc.

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Rocky Flats Plant

LOG OF BORING NO. 52-

Date Drilled 10/20/86 and 11/17/86 to 11/20/86

Boring Method Casing Driver/NC Core

Coordinates N. 35714.8 E 13010.8 Ground Surface Elevation 6124.00'

Boring	Method	Casing	Driver/NC Core Ground Su	LIECA EIGARI	ion 6124.00°	
Elev. De (feet) (fe	pth Sample let) Type	Graphic Log	Material Description	Penetration Resistance (Blows/Foot) 20 40	Content	Other Tests
-12 -13		ogged by	114.5-118.0'-Sample. Recovered 3.0/3.5'=86%. RQD= 0/3.0'=0%. SANDSTONE: yellowish gray (5Y 7/2); medium to very fine-grained; interbedded with silty sandstone and clayey siltstone; dark yellowish orange stains (10YR 6/6) throughout; appears in bands at 60-70° from horizontal; soft; damp.  118.0-123.0'-Sample. Recovered 3.0/5.0'=60%. RQD=2.7/3.0'=90%. SANDSTONE: yellowish gray (5Y 7/2); bounded with dark yellowish orange (10YR 6/6); fine to very fine-grained; grades into silty sandstone, sandy siltstone and clayey siltstone; beds are 0.3- 0.8 ft. thick; bedding is dipping 35°-40° from horizontal; some cross bedding; cut and fill structures; banding of iron stain follows bedding; soft; wet.  123.0-128.0'-Sample. Recovered 4.0/5.0'=80%. RQD=3.4/4.0'=85%. SANDSTONE: same as above; dips of bedding at 40-45°; wet.  128.0-133.0'-Sample. Recovered 1.3/5.0'=26%. RQD=1.0/1.3'=77%. SILTSTONE: yellowish gray (5Y 3/2); banded iron stain; sandy; sand clayey layers; soft; wet.		Checked by:	
nemarks	1.4	OSSER DA	. 1. Guilivel and 1. nathing		GRECKET BY:	1747 TX

Project No. 106P06222

Hydro-Search, Inc.

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Rocky Flats Plant

LOG OF BORING NO. 52-86

10/20/86 and 11/17/86 to 11/20/86 Date Drilled Boring Method Casing Driver/NC Core

Coordinates 35714.8 E 13010.8 Ground Surface Elevation 6124.00'

5011	IIO MAI		Casing	Driver/NC Core			
Elev. (feet)	Depth (feet)	Semple Type	Graphic Lóg	Material Description	Penetration Resistance (Blows/Foot) 20 40	Cont on t	Other Tests
	140						
				133.0-136.0'-Sample.			
				Recovered 2.8/3.0'=93%.		Α Τ	
	_			RQD=0.6/2.8'=21%. SILTSTONE: similiar to			
	-			above with alternating			
	_			layers of sandy siltstone			
				and clayey siltstone; dark		-	
				gray (N 3/0) with		_	
	_			occasional dark yellowish			
				orange (10YR 6/6) layers;			
				wood fragments; highly		_	
				fractured; bedding appears to be at very high angles		_	
	-			(40-60°); firm; damp.			
	145			(40-00 // 1111/ daip.			
	145					_	
				136.0-141.0'-Sample.		_	
	-			Recovered 1.6/5.0'=32%.			j i
				RQD=0.6/1.6'=38%.		_	
				SILTSTONE: same as above;		_	
				calcareous cement; dark gray (N 3/0) layer of			
	-			laminated siltstone and	Ì		
				fine-grained sandstone;	l		
				light gray (N 5/0) to dark	i	_	1
				gray (N 3/0); hard; damp.	1	_	
	_						1
	_			141 0-145 01-010		•	
	150			141.0-145.0'-Sample. Recovered 4.2/4.0'=105%.	}	-	
i i	<del>-1</del> 50			RQD=2.0/4.2'=97%.	1		
	-			SILTSTONE: same as above.			
	_						
				345 6 346 64 6	•	j -	
				145.0-149.0'-Sample.	ŧ.	_	
	_			Recovered 2.3/4.0'=57%. RQD=2.0/2.3'=87%.		_	
	_			SILTSTONE: dark gray (N			1
				3/0); clayey; some		-	1 1
				sandstone beds (.2 to .4'	<u>[</u>	· -	
	_	<del>' ' '</del>		thick); sandstones and	1		
	_	ł		silty, very fine to fine-	-		1
		1	i	grained; color change to		-	1 1
	155	1		medium light gray (N 5/0);		-	1 1
	<b>1</b> 55	ì		50-60° dip; firm; damp.	•		
	-	ł				•	
	_	Į į	ı	149.0-154.0'-Sample.	1	] -	1
		•	1	Recovered 3.5/5.0'=70%.	1	-	• · · · · · · · · · · · · · · · · · · ·
		1		RQD=2.0/3.5=57%. SILTSTONE: same as above.	Į.	i -	į į
	_	ł	I	Taratana. Same as above.	1	1	
	-	Į	ł		1	1 -	1 1
		l	l	TOTAL DEPTH: 153.50'	1	I -	{ I
		1	i		l	· -	Į I
	_	1	l				]
	_	ł	I	<b>f</b>		•	
						<b>.</b>	<b>4</b> 1
	160	1					
	- la -		7 <del>-</del>	bee T Cullivar and T Murnhy		Checked by:	SHA
Rema	ITKS		rogged	by: T. Gulliver and T. Murphy		decker by.	-747

Project No. 106P06222

Hydro-Search, Inc.

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WELL	52-86

CONSULTING HYDROLOGISTS-GEOLOGISTS

		6	2 %	1		WELL -	52-8	36	
	-		0	WELL CONST	RUCTION S	SUMN	/AR	<b>/</b> -	
				WEEE 3311311					,
			Mh.	LOCATION OF COORDS:	ELEVATION: GRO	UND LEVE OF CASIA	-	5124.00 5126.69	
					TOP	OF CASIF			
ı	J-c		19	DRILLING SUMMARY:	CONSTRUCTIO	N TIME	LOG:		
- 1	Ш		1	TOTAL DEPTH Well: 125.65 Hole: 155.80'		1 5	ART	FIR	113H
- 1	Ш		0	BOREHOLE DIAMETER 0.00' -76.00': 5 5/8"	TASK	DATE	DME	PATE	TIME
ı	H		0.0	76.00 - 153.20' : 4 3/4"	DRILLING:		0000		1/55
	40		D.	DRILLER Boyles Brothers Drilling Co. 15865 W. 5th Ave., Golden, CO	5 5/8" casing advancer		1500	$\frac{10/20}{11/19}$	
4	Ш		MD.C	(Robert Roach)	Reaming	11/20		11/24	
Rocky Plets Plant			000	0.00'-76.00': Casing advancer; 76.00'-76.00': Failing 176.00'-76.00': Down hole hammer	GEOPHYS LOSGING				
크	11		0	errisi v. w = 76.00 : Pown hole hammer				10/00	7 / 5 5
	60		O	76.00'-155.80': Coring bit.	5" steel 2" stainless			10/20 11/26	
Ð	- 11			ORILLING FLUID .Air/Water mist and 11-22 bentonite mud.	Z' stainless	11/20	0300	0	ענפט
2	11		00	SURFACE CASING 5" x 76.0' steel w/ lock-	FILTER PLACEMENT	11/26	0930	11/26	1500
					CEMENTING:	11/26	1600	11/26	1730
8	80			WELL DESIGN:	CEVELOPMENT:				
LOCATION	80 80			BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG	OTHER: Bentonite	11/26	1500	11/26	1600
2		THAN .	遺	CASING STRINGSI: C=CASING S=SCREEN  0.00' 73.45'C1	<u> </u>	$\frac{11}{25}$		—	1200
		≡		0.00'- 92.00'C2	Packer testing	11/20	0730	11/20	1700
	L			92.90 - 125.80 <b>SI</b>					
1	100	∭≣							
	11				WELL DEVELOP	MENT	· · · ·		
	11				See Well Devel	opment !	Summary	Sheet.	
	120			CASING: C1 5" I.D. steel surface casing					<del></del>
				less steel, threaded and flush					
	11		冒	jointed.					
			竇.	SCREEN: SI 2" I.D. Sch. 5 type 316 stain-					
4	(-1			less steel, threaded and flush	COMMENTS:				
7000				Officer, O'OLO ATTE ALTONS	_			a! 1 1 1	
2				screen, 0.25' welded bottom cap.	No water encour	rered c	TI TIME	Trilling.	_
1			Ħ	ZHTRALIZERS	Top of stainles	s steel	casin	2.55	
=	160				Well built th	rough	4" ca	sing.	
ACUEC.			11,	PLTER MATERIAL 16-40 silica sand	11/22-Used be fluid.	ntonit	e mud	drilli	ing
	lj		-	87.00' - 125.80'	11/25-Washed	hole w	vith 2	/00 gal	lone
			119	D.00' -85.00'	of wate			-00 gal	10115
	180		, , -	THER 3/8" bentonite pellets	11/26-Pulled				
	İ		11-	85.00' - 90.00'	ft of casi			Broke	off
			-	128.00' - 147.00'	from 129.0	- 147	.0		
	200		Ц	HYDRO-SEARCH RENO-DEHVER	CONSULTING HY	ROLO	SISTS-	GEOLOG	ISTS

PROJECT

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#### Water Level Data for Rockwell (Rocky Flats)

Depth to Water from TOC	Elevation TOC (ft)	Water Level Elev. (ft)		
5286				
64.64	6126.69	6062.05		
70.05	6126.69	6056.64		
<b>68.</b> 90	6126.69	6057.79		
68.79	6126.69	6057.90		
68.10	6126.69	6058.59		
68.56	6126.69	6058.13		
68.60	6126.69	<b>6058.</b> 09		
68.20	6126.69	6058.49		
68.20	6126.69	6058.49		
67.50	6126.69	6059.19		
68.90	6126.69	6057.79		
67.40	6126.69	6059.29		
67.70	6126.69	6058.99		
	from TOC  5286  64.64 70.05 68.90 68.79 68.10 68.56 68.60 68.20 68.20 67.50 68.90 67.40	from TOC       TOC (ft)         5286       64.64       6126.69         67.50       6126.69       68.90         68.79       6126.69       68.10         68.10       6126.69       68.60         68.56       6126.69       68.60         68.20       6126.69       68.20         67.50       6126.69       68.90         67.40       6126.69       6126.69		

#### INDEX OF DATA

Boring	No.: 54-86						
Comple	Completed as well? yes						
Data in	File						
<u> </u>	Log of Borehole						
X	Well Construction Summaries						
	Well Development Summaries						
	Hydraulic Conductivity Test Data						
	and Results						
<u> </u>	Packer Test Data and Results						
<u> </u>	Water Level Data						

Rocky Flats Plant

### LOG OF BORING NO.

Date Drilled 9/22/86, 10/9/86

Coordinates N 32292.9

E 15216.1

Boring Method Casing Driver/NC Core

Ground Surface Elevation 6103.39

Boring Method Casing Driver/NC Core Ground Surface Elevation 6103.39						
Elev. (feet)	Depth Ser (feet) Ty	mpk Graphic pe Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	Content 20 40	Other Tests
	0	200	ROCKY FLATS ALLUVIUM	1111		
	1 7	0.00	1	•	]	
	<del>                                    </del>		0-5.0'-Cuttings.	1		
	1 1	000	BOULDERS: moderate brown (5YR 4/4); 70% quartzite		1	
	+	-0.00	boulders; 30% sandy silt;		1	
	-	0.00	<pre>iron staining; poorly sorted; unconsolidated;</pre>		-	
	1 <del></del>	<b>−</b> ′.%ö	dry.		-	
	-	0000			-	
	_		1		-	
	1 1	0.00	<b>'</b>	]	1 -	
	J_ 5	b	1		<b>!</b> ⊸	
	'	000	5.0-8.0'-Cuttings. GRAVELS: moderate brown		₹ — — <del> </del>	
			(5YR 4/4); granite and	Į į	ا ا	
		6.0.9	quartzite pebbles and	1	ا ا	
	1	000	<pre>cobbles; 20-30% quartzite boulders; some silty sand;</pre>	1	]	
	<b>-</b>  -	F8.0.	iron staining; poorly			
	1 1	000	sorted; unconsolidated; dry.		7	
	-	0.0		<b>[</b>	1	
	<del> </del>	0000	8.0-15.0'-Cuttings.		1 1	
	<b>│                                    </b>	— <u>:</u> () %	BOULDERS: granite and	1	-	· ·
	-		quartzite.		-	
	10 —	o`.`	i e		1 -	
	4	2°°°	·	1	1	
1 1				<b>[</b>	-	
	J	3000		]	_	
		Do. 62	·	]	_	
[		·S(0;		, l	ا ا	
		?::::07	÷	(		
j \$		0.0		1		
	1	);;;; 		j ł		
j §		3.00	ľ	j l		
! <b>!</b>	4	7,000				
	15		15.0-32.0'-Cuttings.	Į	7	
, 1	4	\$ 30° 5	GRAVEL: moderate brown	]	-	
'			(5YR 4/4); granitic pebbles and cobbles;	] <b>i</b>		
	-		silty; 5% granitic	] ]	-	
	-	<u> </u>	<pre>boulders; poorly sorted; unconsolidated; damp.</pre>	į 1	-	
	-	200		[ ·	4	
		b.o.o.		j 1	4	
1		500		[	_	
	1			j 1	_	
		$^{\prime}_{0}$ $\odot$		1. 1		
	20	000	·	ليبينا		4-4
Rema	rks L	ogged by: 1	G. Gulliver & L. Pivonka		Checked by	AH
Proje	ct No.	I	Huden Const	Inc		
	106P06222	2	Hydro-Search,	IIIC.	Page 1 of 5	

Rocky Flats Plant

### LOG OF BORING NO.

Date Drilled 9/22/86, 10/9/86

106P06222

Coordinates N 32292.9

E 15216.1

Boring Method Casing Driver/NC Core

**Ground Surface Elevation** 

6103.39

Page 2 of 5

Elev. (feet)	Depth (feet)	Sample Graph Type Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	Content 20 40	Other Tests
	20	Ó.s	2	1111		
		200				
		- 0 - 0	8			
		,000	<b>3</b>			
		500				
		0.0				
		.0.				
		0.0				
		0				
	—25 <b>—</b>	0.0				
		0	į			
		J. 0.	7			
		K°Ö°			,	
		00.0			_	
.		000				
ı		$\mathcal{O}_{\mathcal{O}}^{Y_{\mathcal{O}}}$			_	
ı	_	2000	7	·		
l		0.00				
L	<del></del> 30 <del></del>	000	4		_	
	_	.0			_	
					4	
		0.00				
		Ų,				
I		0.0	32.0-34.0'-Cuttings. GRAVEL: moderate brown		4	
I			(5YR 4/4); 30-40% granite		4	
1	4		and quartzite cobbles and boulders; some silty sand:			
	_	(0) 2 5	poorly sorted;		4	
ł	4		unconsolidated; moist.			
-	<b>—</b> 35 <b>—</b>		34.0-36.0'-Cuttings.		4	
	4		SILT: dark yellowish orange (10YR 6/6); sandy;		- 4	
	4		very fine-grained; moderate sorting;		4	
	4		unconsolidated; moist.	i	4	
	4		LARAMIE FORMATION		4	i
I	4					
l	4		36.0-49.5'-Cuttings. CLAYSTONE: light olive		4	
	4		gray (5Y 5/2); some dark		4	
I			yellowish orange (10YR 6/6) mottles; weak		4	
I	<b>∠</b>		lamination; damp.	1		
Remar	40	Loosed by	T. Gulliver & L. Pivonka		Checked by:	LIP
		meger by.	1. Gallivel a L. Fivolika		diecken by	1247
<b>PFOje</b> (	ct No.		Hydro-Search I			

Hydro-Search, Inc.

Rocky Flats Plant

### LOG OF BORING NO.

Date Drilled 9/22/86, 10/9/86

Coordinates N 32292.9

E 15216.1

	Boring Method Casing Driver/NC Core  Ground Surface Elevation 610,3.39						
Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Content 20 40	Other Tests
	40		***				
1 1	_						
	٦						
	_						
i 1							
					·		
	45 —						
	_						
1 1	-						
	_			,			
	_	·					
	_						
	-						
	-			49.5-50.0'-Cuttings.			
i i	50			CLAYSTONE: brownish gray (5YR 4/1); weak lamina-		-	
	_			tion; damp.		1	
	_			-			
	-			50.6-55.6'-Sample.			
				Recovered 5.0/5.0'=100%. CLAYSTONE: medium gray (N		٦	
	_			<li>5) and light olive gray</li>	! !	1	
·				(5Y 6/1); greasy; some FeO partings/stringers; trace		1	
	_			of carbonaceous partings;		-	
	_			moist.	[ [		
	_			55.6-60.6'-Sample.	1	-	
	<b>—</b> 55 <b>—</b>			Recovered 5.0/5.0'=100%. CLAYSTONE: light olive	i i		
	4			gray (5Y 6/1); greasy;	1	-	
				abundant FeO mottling;		4	
	_			heavy concretions of FeO from 57.2-57.6'; moist.	ļ i	4	
					j j	4	
	-						
	_				i i		
	_				į <u> </u>	4	
	_				<u> </u>	4	
1					1 , , , , 1	1	
	60			· · · · · · · · · · · · · · · · · · ·			

Remarks

Logged by: T. Gulliver & L. Pivonka

Checked by:

Project No. 106P06222

Hydro-Search, Inc.

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Rocky Flats Plant

### LOG OF BORING NO.

54-86

Date Drilled 9/22/86, 10/9/86

Boring Method Casing Driver/NC Core

Ground Surface Elevation 6103.39

Borning men	Casing	Driver/NC Core			
Elev. Depth (feet) (feet)	Semula Graphi Type Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	20 40	Other Tests
60		60.6-65.6'-Sample. Recovered 5.0/5.0'=100%. CLAYSTONE: light olive gray (5Y 6/1); greasy; abundant FeO mottling and concretions; mottling and concretion content increases with depth; moist to wet.  65.6-70.6'-Sample. Recovered 5.0/5.0'=100%. SANDY CLAYSTONE: light olive gray (5Y 6/1) to medium dark gray (N 4); some fine-grained sand; heavy FeO concretions from 65.6-65.9'; sand content increases with depth; moist.  70.6-73.6'-Sample. Recovered 3.0/3.0'=100%. SANDSTONE: dark gray (N 4) to dark yellowish orange (10YR 6/6); clay- rich; very fine-grained; <1.0'of interval is free of clay; well sorted; moist to wet.  73.6-75.6'-Sample. Recovered 2.0/2.0'=100%. CLAYSTONE: medium dark gray (N 4); greasy claystone with trace of FeO stringers; moist.  75.6-80.6'-Sample. Recovered 5.0/5.0'=100%. SANDSTONE: medium gray (N 5); fine-grained; some clay; clay content decreases with depth; trace CaCO3; well sorted; wet.			
Remarks	Logged by:	T. Gulliver & L. Pivonka		Checked by:	TAK.

Project No. 106P06222

Hydro-Search, Inc.

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Rocky Flats Plant

# LOG OF BORING NO.

54-86

Date Drilled 9/22/86, 10/9/86

Boring Method Casing Driver/NC Core

Coordinates N 32292.9

Ground Surface Elevation 6103.39

Bori	ud wer	Casing	Driver/NC Core Ground G	Desetsetles	Water	
Elev.	Depth	Sample Graphi	Material Description	Penetration Resistance	Coffe ht	Other Tests
(feet)	(feet)	Type Log	Material Description	(Blows/Inch) 20 40	20 40	
Elev. (feet)	Depth (feet) 80	Type Log	80.6-84.7'-Sample. Recovered 3.9/4.1'=95%. SANDSTONE: medium dark gray (N 4); fine-grained; some clay-rich sandstone and pure clay interlayers; interlayers are grada- tional and account for 20% of the interval; wet.  84.7-89.6'-Sample. Recovered 3.4/4.9'=69%. SANDY CLAYSTONE: medium dark gray (N 4); 20-30% fine-grained sand; sand content varies gradationally through this interval; moist to wet.  TOTAL DEPTH: 89.6'.	(Blows/Inch)	(%)	Tests
					_	
	100		1	1	, , , , , ,	
			<u> </u>		Charles 1 have	d l
Rema	arks	Logged by	T. Gulliver & L. Pivonka		Checked by:	VARAT.

Project No. 106P06222

Hydro-Search, Inc.

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	54-86
WELL	<del></del>

WELL CONSTRUCTION SUMMARY 6103.39' ELEVATION: GROUND LEVEL -LOCATION or COORDS: E 15216.1 6105.03' N 32296.9 TOP OF CASING .... CONSTRUCTION TIME LOG: **DRILLING SUMMARY:** START FINISH TOTAL DEPTH Well: 85.25' Hole: 97.00' TASK BOREHOLE DIAMETER 0.00' - 49.50': 5 5/8" DATE TIME DATE TIME 49.50' - 97.00': 4 3/4" 1986 1986 DRILLING: 9/22 5 5/8" casing advancer NC Core 1655 DRILLER Boyles Brothers Drilling Co. 9/22 1210 10/10 1100 10/9 1249 15865 W. 5th Avenue Golden, CO (Tom High, Jim Horn) Reaming 10/13 1222 10/13 1056 RIG 0.00-49.50'; casing advancer, 49.50-97.0 GEOPHYS. LOGGING: 8iT(s) 0.00' - 49.50'; down hole hammer CASING: 9/22 9/22 1655 1210 Gulliver, 49.50' - 97.00': Carbide bit, tricone bit 5" steel 2" stainless 10/16 1215 10/16 1245 DRILLING FLUID none SURFACE CASING 5" x 49.70 steel w/ locking 10/16 10/16 1209 1415 FILTER PLACEMENT 10/16 1550 10/17 0946 CEMENTING: FRSONNEL WELL DESIGN: LEVELCPMENT: BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG ___ OTHER: 10/16 10/16 1415 1550 Bentonite CASING STRING(S): C=CASING S=SCREEN 10/16 1145 10/16 1209 0.00' 47.70' Cl 0.00' - 75.43' C2 75.43'- 85.24' SI WELL DEVELOPMENT CASING: C1 5" I.D. steel surface casing c2 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed. Plant SCREEN: SI 2" I.D. Sch. 5 type 316 stain-Rocky Flats less steel, threaded and flush COMMENTS: jointed, 0.010" wire wrap screen Water encountered at 32' during drilling. 0.25' welded bottom cap. CENTRALIZERS None (See comments) Top of stainless steel casing: 1.64' Cave from TD to 89.60' FILTER MATERIAL 32-42 silica sand 74.20' - 85.75' Built well in NC rods, no centralizers used CEMENT Portland Type I 0.00'- 72.00' 90 OTHER 3/8" bentonite pellets 72.00' - 74.20' 85.75' - 89.60' 100 HYDRO-SEARCH RENOODENVER CONSULTING HYDROLOGISTS-GEOLOGISTS

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FACKER TEST ANALYSIS
```

WELL NO. 54-86

ROCKY FLATS PLANT - JOB NO. 106906222

DATE TESTED: 10/10/86 BY: L. FIVONKA

TEST INTERVAL (FEET BELOW G.S.): 55.00 - 65.03

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 32.00

Q L

k( = ----- LN(--)

2(PI)(L)(H) R

1ST P1/3 TEST

Q = INJECTION RATE = .00027077 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 10.03 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 32.00 + 4.90 + 3.50 * 2.31 = 44.99

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .000000039 FT/MIN

K = .000000020 CM/SEC

PC/3 TEST

Q = INJECTION RATE = .00310032 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 10.03 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 32.00 + 4.90 + 11.00 + 2.31 = 62.31

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000326 FT/MIN

K = .00000146 CM/SEC

I .. P1/3 TEST

Q = INJECTION RATE = .00046031 (FEETS/MIN)

L = LENGTH OF TEST INTERVAL = 10.03 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 32.00 + 4.90 + 3.50 * 2.31 = 44.99

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000067 FT/MIN

K = .00000034 CM/SEC

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PACKER TEST ANALYSIS
```

WELL NO. 54-86

ROCKY FLATS PLANT JOB NO. 106F06222

DATE TESTED: 10/10/86 BY: L. PIVONKA

TEST INTERVAL (FEET BELOW G.S.): 65.00 - 75.03 MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 32.00

K = ----- LN(--)

15, TT 2017 C 71 S 71 S 71 S 71 S 71 S

2(P1)(L)(H) R

1ST P1/3 TEST

Q = INJECTION RATE = .00010831 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 10.03 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 32.00 + **4.9**0 + 4.00 * 2.31 = 46.14

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000015 FT/MIN

K = .00000008 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00078523 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 10.03 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 32.00 + 4.90 + 13.00 * 2.31 = 66.93

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .000000077 FT/MIN

K = .00000039 CM/SEC

2ND 81/3 TEST

Q = INJECTION RATE = .00008123 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 10.03 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 32.00 + 4.90 + 3.50 * 2.31 = 44.99

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000012 FT/MIN

K = .00000006 CM/SEC

PACKER TEST ANALYSIS KELL NO. 54-86

ROCKY FLATS FLANT JOB NO. 106F06222

DATE TESTED: 10/10/86 BY: L. PIVONKA

TEST INTERVAL (FEET BELOW G.S.): 73.00 - 83.03

MATERIAL TESTED: ARAPAHDE SANDSTONE

DEPTH TO WATER (FEET BELOW G.S.): 32.00

K = ---- LN(--)=2(FI)(L)(H) R

1ST P1/3 TEST

Q = INJECTION RATE = .00148924 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 10.03 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAL = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 32.00 + 4.70 + 4.00 * 2.31 = 46.14

R = SOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000211 FT/MIN

K = .00000107 CM/SEC

P2/3 TEST

 $\Omega$  = INJECTION RATE = .00415632 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 10.03 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 32.00 + 4.90 + 15.50  $\times$  2.31 = 72.71

R = SUREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000375 FT/MIN

-K = .00000190 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00066339 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 10.03 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 32.00 + 4.90 + 3.50 * 2.31 = 44.99

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000097 FT/MIN

K = .00000049 CM/SEC

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Water Level Data for

Rockwell (Rocky Flats)

Date Measured	Depth to Water from TOC	Elevation TOC (ft)	Water Level Elev. (ft)
** Well Numbe	r: 5486		
07/07/86	39.75	6105.03	6065.28
10/24/86	45.25	6105.03	6059.78
10/27/86	60.16	6105.03	6044.87
10/29/86	76.60	6105.03	6028.43
11/03/86	57.87	6105.03	6047.16
11/04/86	73.19	6105.03	6031.84
11/12/86	75.56	6105.03	6029.47
11/14/86	71.44	6105.03	6033.59
11.17/86	67.09	6105.03	6037.94
11/18/86	75.28	6105.03	6029.75
11/25/86	73.70	6105.03	6031.33
01/01/87	40.17	6105.03	6064.86
05/08/87	41.04	6105.03	6063.99
<b>06</b> /02/87	55.38	6105.03	6049.65
07/13/87	38.30	6105.03	6066.73
08/03/87	48.70	6105.03	6056.33
08/10/87	42.10	6105.03	6062.93
09/29/87	40.00	6105.03	6065.03
11/02/87	40.70	6105.03	6064.33

#### INDEX OF DATA

Boring	No.: 55-86
Comple	eted as well? yes
Data in	File
X_	Log of Borehole
X_	Well Construction Summaries
X_	Well Development Summaries
X_	Hydraulic Conductivity Test Data
	and Results
	Packer Test Data and Results
X	Water Level Data

Rocky Flats Plant

### LOG OF BORING NO.

55-86

Date Drilled 9/29/86

Boring Method Casing Driver

Coordinates N 32259.5 E 15

Ground Surface Elevation 6103.62

Elev. (feet)	Depth (feet)	Semple Graphic Type Log		Penetration Resistance (Blows/Inch) 20 40	Content Content 20 40	Other Tests
	0	000	ROCKY FLATS ALLUVIUM			
			0-3.0'-Cuttings.		_	
	_	4.05	BOULDERS: quartzite; dry.		-	
	_	0,0	3.0-4.0'-Cuttings. CLAY:		-	
	_	ه و و	light brown (5YR 5/4);		-	
			silty; semi-plastic; unconsolidated; damp.		-	
	-	0.0	4.0-26.0'-Cuttings.		-	
	-	7.00	GRAVEL: moderate brown		-	
	_	Do	(5YR 4/4); granite and quartzite pebbles, cobbles		-	
	5 —	p. 0	and boulders with coarse			
	-	• O • •	to very fine-grained sand; poorly sorted;		-	
		0.00	unconsolidated; damp.		-	
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ł	7	Pess		1	7	
	20					
Rema	rks	Logged by: T.	Gulliver		ک: Checked by	

Project No.

106P06222

Hydro-Search, Inc.

Page 1 of 2

Rocky Flats Plant

## LOG OF BORING NO.

55-86

Date Drilled 9/29/86

Boring Method Casing Driver

Coordinates N 32259.5 E 15217.2

Ground Surface Elevation 6103.62

				144 - 4				
Elev. Depth (feet) (feet)	Semple Graphic Type Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content 20 40	Other Tests			
20		26.0-27.0'-Cuttings. GRAVEL: moderate brown (5YR 4/4); granitic pebbles and cobbles with very fine-grained silty sand; poorly sorted; unconsolidated; damp.  27.0-32.0'-Cuttings. BOULDERS: granite and quartzite; damp.  32.0-33.0'-Cuttings. BOULDER: granitic; damp.  33.0-34.0'-Cuttings. SAND: pale yellowish brown (10YR 5/2) to pale brown (5YR 5/2); very fine-grained to very coarse-grained; silty; poorly sorted; rounded; damp.  34.0-35.5'-Cuttings. CLAY: moderate brown (10YR 4/4); sandy; very fine-grained; quartzite gravel at base; plastic; moist.  LARAMIE FORMATION  35.5-36.5'-Cuttings. CLAYSTONE: light olive gray (5Y 5/2) and dusky yellow (5Y 6/4); silty; plastic; moist.  TOTAL DEPTH: 36.5'						
	I	r Cullivor		Checked by:	JAP			
nomarks	Remarks Logged by: T. Gulliver Checked by:							

Project No.

106P06222

Hydro-Search, Inc.

Page 2 of 2

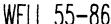
WFII	55-86		

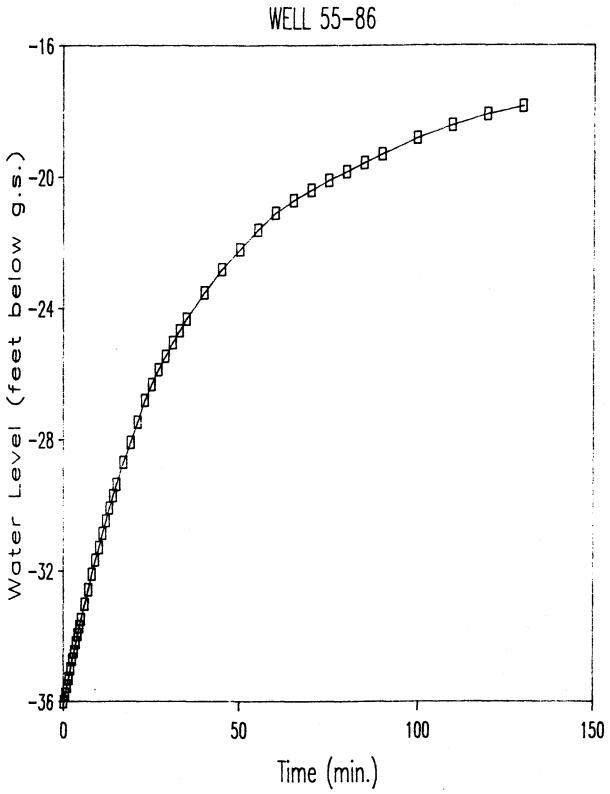
		19	///: 888		<b>#</b>	WELL CONSTRUCTION SUMMARY					
					8.0	LOCATION or COORDS: ELEVATION: GROUND LEVEL					
		10			000	DRILLING SUMMARY:  TOTAL DEPTH Well: 36.39' Hole: 36.50'	CONSTRUCTION TIME LOG: START FINISH			IISH	
					• {	BOREHOLE DIAMETER 5.5/8"	TASK DRILLING:	<u>DATE</u> 1986	DME	<u>DATE</u> 1986	TIME
		-20				DRILLER <u>Boyles Brothers Drilling Co.</u> 15865 W. 5th Avenue	5 5/8" casing advancer	9/29	1120	9/29	1440
8	er		1		0 U 0	Golden, CO (Arrow Drilling -  RIG Casing advancer Tom High)  BIT(S) Down hole hammer	GEOPHYS. LOGGING: CASING:				
Golden, C	Gulliver	_30				DRILLING FLUID None	2" stainless	9/29	1705	9/29	1710
8	L I.				2	SURFACE CASING 5" x 4.75' steel w/ locking	FILTER PLACEMENT: CEMENTING:	9/29 9/30	1710 1105	9/30 9/30	1100
LOCATION _	PERSONNEL	-40				WELL DESIGN:  BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG	CEVELOPMENT: OTHER:	10/2	1600	10/16	1600
700	PER					CASING STRING(S): C=CASING S=SCREEN    0.00'   3.55'   C1	Bentonite	9/30	1100	<u>9/30</u> 	1105
		<b>-50</b> -60					WELL DEVELOF		Summary	Sheet.	
	ant					CASING: CI 2" I.D. Sch 5 type 316 stain— less steel, threaded and flush jointed.					
PROJECT 106P06222	Rocky Flats Plant	70				SCREEN: SI 2" I.D. Sch. 5 type 316 stain- less steel, threaded and flush jointed, 0.010" wire wrap screen, 0.25' slip on bottom cap.	COMMENTS: No water encour	ntered d	uring d	rilling	
		80				CENTRALIZERS Type 304 stainless steel 23.81' - 25.04'	Top of stainles	s steel	casing	: 2.19	
		<b>–</b> 90				FILTER MATERIAL 32-42 silica sand 2.48' - 36.50'  CEMENT Portland Type I 0.00' - 1.80'  OTHER 3/8" bentonite pellets 1.80' - 2.48'					
	Į	_ 100	)			HYDRO-SEARCH RENO+DENVER	CONSULTING HY	DROLC	GISTS	-GEOLO	GISTS

#### WELL DEVELOPMENT SUMMARY

1 Well Bore Volume = 3.35 gals.	DATE	TIME	METHOD	VOLUME	APPEARANCE	COMMENTS
10-3-86   1135   Bailed   6.5 gals.   dark brown   6.5/33.5 gals. purged to date   10-6-86   1500   Bailed   5.0 gals.   Light-medium brown   11.5/33.5 gals. purged to date   10-7-86   1350   Bailed   5.0 gals.   Light-medium reddish brown   16.5/33.5 gals. purged to date   10-8-86   1500   Bailed   5.0 gals.   Light-medium brown   21.5/33.5 gals. purged to date   10-9-86   1345   Bailed   5.0 gals.   Light-medium brown   26.5/33.5 gals. purged to date   10-9-86   1600   Bailed   5.0 gals.   Light-medium brown   26.5/33.5 gals. purged to date   10-10-86   0945   Bailed   5.0 gals.   Light-medium brown   36.5/33.5 gals. purged to date   10-10-86   1335   Bailed   5.0 gals.   Light brown   41.5/33.5 gals. purged to date   10-14-86   1115   Bailed   5.5 gals.   Medium brown mist, sandy   —   Medium brown mist, sandy   —     Medium to light brown   52/33.5 gals. purged to date   10-15-86   1130   Bailed   5.0 gals.   Light brown   52/33.5 gals. purged to date   Light brown   52/33.5 gals. purged to date   Light brown   57/33.5 gals.   Light brown   57/33.5 gals.   Light brown   57/33.5 gals.   Light brown   57/33.5 gals.   Light brown   57/33.5 gals.   Light brown   57/33.5 gals.   Light brown   57/33.5 gals.   Light brown   57/33.5 gals.   Light brown   57/33.5 gals.   Light brown   57/33.5 gals.   Light b	10-2-86	1600	Airlifted			<pre>1 Well Bore Volume = 3.35 gals. 10 Well Bore Volumes = 33.5 gals.</pre>
10-7-86   1350   Bailed   5.0 gals.   Light-medium reddish brown   16.5/33.5 gals. purged to date   10-8-86   1500   Bailed   5.0 gals.   Light - medium reddish-brown   21.5/33.5 gals. purged to date   10-9-86   1345   Bailed   5.0 gals.   brown   26.5/33.5 gals. purged to date   10-9-86   1600   Bailed   5.0 gals.   brown, clearing   31.5/33.5 gals. purged to date   10-10-86   0945   Bailed   5.0 gals.   brown   36.5/33.5 gals. purged to date   10-10-86   1335   Bailed   5.0 gals.   Light-medium   5.0 gals.   brown   36.5/33.5 gals. purged to date   10-14-86   1115   Bailed   5.5 gals.   brown   41.5/33.5 gals. purged to date   10-15-86   0930   Airlifted	10-3-86	1135	Bailed	6.5 gals.	1 -	6.5/33.5 gals. purged to date
10-7-86   1350   Bailed   5.0 gals.   reddish brown   16.5/33.5 gals. purged to date     10-8-86   1500   Bailed   5.0 gals.   Light - medium reddish-brown   21.5/33.5 gals. purged to date     10-9-86   1345   Bailed   5.0 gals.   Light-medium brown   26.5/33.5 gals. purged to date     10-9-86   1600   Bailed   5.0 gals.   Light-medium brown, clearing   31.5/33.5 gals. purged to date     10-10-86   0945   Bailed   5.0 gals.   Light-medium brown   36.5/33.5 gals. purged to date     10-10-86   1335   Bailed   5.0 gals.   Light brown, clearing   41.5/33.5 gals. purged to date     10-14-86   1115   Bailed   5.5 gals.   Medium to light brown   47/33.5 gals. purged to date     10-15-86   0930   Airlifted	10-6-86	1500	Bailed	5.0 gals.	Light-medium brown	11.5/33.5 gals. purged to date
10-8-86   1500   Bailed   5.0 gals.   reddish-brown   21.5/33.5 gals.   purged to date	10-7-86	1350	Bailed	5.0 gals.		16.5/33.5 gals. purged to date
10-9-86   1345   Bailed   5.0 gals.   brown   26.5/33.5 gals. purged to date     10-9-86   1600   Bailed   5.0 gals.   Light-medium   brown, clearing   31.5/33.5 gals. purged to date     10-10-86   0945   Bailed   5.0 gals.   Light brown   36.5/33.5 gals. purged to date     10-10-86   1335   Bailed   5.0 gals.   Light brown, clearing   41.5/33.5 gals. purged to date     10-14-86   1115   Bailed   5.5 gals.   Medium to light brown   47/33.5 gals. purged to date     10-15-86   0930   Airlifted   —   Medium to light brown   mist, sandy   —     10-15-86   1130   Bailed   5.0 gals.   Light brown   52/33.5 gals. purged to date     10-15-86   1500   Bailed   5.0 gals.   Light brown   57/33.5 gals. purged to date     10-15-86   1500   Bailed   5.0 gals.   Light brown   57/33.5 gals. purged to date     10-15-86   1500   Bailed   5.0 gals.   Light brown   57/33.5 gals. purged to date     10-15-86   1500   Bailed   5.0 gals.   Light brown   57/33.5 gals. purged to date     10-15-86   1500   Bailed   5.0 gals.   Light brown   57/33.5 gals. purged to date     10-15-86   1500   Bailed   5.0 gals.   Light brown   57/33.5 gals.   purged to date     10-15-86   1500   Bailed   5.0 gals.   Light brown   57/33.5 gals.   purged to date     10-15-86   1500   Bailed   5.0 gals.   Light brown   57/33.5 gals.   purged to date	10-8-86	1500	Bailed	5.0 gals.		21.5/33.5 gals. purged to date
10-9-86   1600   Bailed   5.0 gals.   brown, clearing   31.5/33.5 gals. purged to date     10-10-86   0945   Bailed   5.0 gals.   Light-medium   brown   36.5/33.5 gals. purged to date     10-10-86   1335   Bailed   5.0 gals.   Light brown, clearing   41.5/33.5 gals. purged to date     10-14-86   1115   Bailed   5.5 gals.   Medium to light brown   47/33.5 gals. purged to date     10-15-86   0930   Airlifted   — Medium brown   mist, sandy   —     10-15-86   1130   Bailed   5.0 gals.   Light brown   52/33.5 gals. purged to date     10-15-86   1500   Bailed   5.0 gals.   Light brown   57/33.5 gals. purged to date     10-15-86   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown   Light brown	10-9-86	1345	Bailed	5.0 gals.	1 -	26.5/33.5 gals. purged to date
10-10-86   0945   Bailed   5.0 gals.   brown   36.5/33.5 gals. purged to date	10-9-86	1600	Bailed	5.0 gals.	, –	31.5/33.5 gals. purged to date
10-10-86   1335   Bailed   5.0 gals.   Clearing   41.5/33.5 gals. purged to date	101086	0945	Bailed	5.0 gals.	, –	36.5/33.5 gals. purged to date
10-14-86	10-10-86	1335	Bailed	5.0 gals.	, -	41.5/33.5 gals. purged to date
10-15-86	10-14-86	1115	Bailed	5.5 gals.		47/33.5 gals. purged to date
10-15-86 1130 Bailed 5.0 gals. brown 52/33.5 gals. purged to date  Light brown to clear 57/33.5 gals. purged to date  Light brown 57/33.5 gals. purged to date  Light brown	10-15-86	0930	Airlifted		1	_
10-15-86         1500         Bailed         5.0 gals.         to clear         57/33.5 gals. purged to date           Light brown         Light brown	10-15-86	1130	Bailed	5.0 gals.		52/33.5 gals. purged to date
	10-15-86	1500	Bailed	5.0 gals.	1 -	57/33.5 gals. purged to date
	10-16-86	1600	Bailed		• ,	Sampled

# AQUIFER TEST DATA





AQUIFER TEST DATA

**WELL 55-86** 

Type of Aquifer Test:

Bail down - Recovery

How 9 Measured: 4.5 gallon bucket

Project No.: 106P06222 Location: Rocky Flats Plant

How W.L.'s Measured:

Olympic Well Sounder

Measuring Point for W.L.'s:

Top of Casing

Personnel: D. Pavlick, M. Bergman

Elevation of Measuring Point: 6115.2

Depth of pump/airline: N/A

Start bailing: 10/21/86

Time: 13:46:00

Stop bailing:

49.0

45.0

10/21/86

14:00:00 Time:

Duration of Aquifer Test:

134 minutes

TIME t = 4.0 min.	at t' = 0		R LEVEL DATA Water Level: 15.96	COMMENTS
t	t'	Water Level	Draw- down	
0				Begin bailing
4.0	0	36.00	20.04	Stop bailing
4.5	.5	35.77	19.81	Bailed 5 gallons
5.0	1.0	35.53		***************************************
5.5	1.5	35.29	19.33	
6.0	2.0	35.00	19.04	
6.5	2.5	34.71	18.75	•
7.0	3.0	34.48	18.52	
7.5	3.5	34.20	18.24	
8.0	4.0	33.95	17.99	
8.5	4.5	33.71	17.75	
9.0	5.0	33.49	17.53	
10.0	6.0	33.02		
11.0	7.0	32.57	16.61	
12.0	8.0	32.10	16.14	
13.0	9.0	31.67	15.71	
14.0	10.0	31.29	15.33	
15.0	11.0	30.86	14.90	
16.0	12.0	30.48	14.52	
17.0	13.0	30.09	14.13	
18.0	14.0	29.71	13.75	
19.0	15.0	29.37	13.41	
21.0	17.0	28.70	12.74	
23.0	19.0	28.09	12.13	
25.0	21.0	27.47	11.51	
27.5	23.0	26.80	10.84	
29.0	25.0	26.32	10.36	
31.0	27.0	25.87	9.91	
33.0	29.0	25.46	9.50	
35.0	31.0	25.05	9.09	
37.0	33.0	24.69	8.73	•
39.0	35.0	24.33	8.37	
44.0	40.0	23.53	7.57	
		20.00	,	

22.82

6.86

54.0	50.0	22.21	6.25
59.0	55.0	21.61	5.65
64.0	60.0	21.10	5.14
69.0	65.0	20.71	4.75
74.0	70.0	20,40	4.44
79.0	75.0	20.10	4.14
84.0	80.0	19.84	3.88
89.0	<b>85.</b> 0	19.57	3.61
94.0	90.0	19.31	3.35
104.0	100.0	18.82	2.86
114.0	110.0	18.43	2.47
124.0	120.0	18.10	2.14
134.0	130.0	17.86	1.90

90% Recovered at

20.16

Page No. 12/11/87

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Water Level Data for

Rockwell (Rocky Flats)

Date Measured	Depth to Water from TOC	Elevation TOC (ft)	Water Level Elev. (ft)
** Well Numbe	r: 5586		
10/02/86	17.95	6105.81	6087.86
10/03/86	18.08	6105.81	6087.73
10/06/86	18.41	6105.81	6087.40
10/07/86	18.34	6105.81	6087.47
10/08/86	18.41	6105.81	6087.40
10/09/86	18.56	6105.81	6087.25
10/10/86	19.50	6105.81	6086.31
10/13/86	18.33	6105.81	6087.48
10/16/86	18.37	6105.81	6087.44
11/26/86	18.63	6105.81	6087.18
01/01/87	18.60	6105.81	6087.21
05/11/87	7.15	6105.81	6098.66
06/02/87	8.90	6105.81	6096.91
07/08/87	10.05	6105.81	6095.76
07/13/87	11.00	6105.81	6094.81
08/03/87	7.20	6105.81	6098.61
08/10/87	12.90	6105.81	6092.91
09/29/87	15.60	6105.81	6090.21
11/02/87	16.00	6105.81	6089.81

#### INDEX OF DATA

Boring No.:56-86						
Comple	Completed as well? yes					
Data in	File					
X	Log of Borehole					
X_	Well Construction Summaries					
X_	Well Development Summaries					
X_	Hydraulic Conductivity Test Data					
	and Results					
	Packer Test Data and Results					
X	Water Level Data					

Rocky Flats Plant

### LOG OF BORING NO.

Date Drilled 9/26/86

Coordinates N 34071.9 E 17104.2

Ground Surface Flevation 5977 16

Boring Method Casing Driver Ground Surface Elevation 5977.16							
Elev. (feet)	Depth (feet)	Sample Grad Type Lo	Material Description (Blo	netration Water Other Content Tests 20 40 20 40			
Elev. (feet)	Depth (feet)	700 000 300	Material Description (Blo	ows/inch) (%)			
	15 - 1		TOTAL DEPTH: 17.0'				
Remarks Logged by: T. Gulliver Checked by:							
Project No. 106P06222  Hydro-Search, Inc. Page 1 of 1							

	FI		56-86	
-	2	L. L.	 <u> </u>	 

## WELL CONSTRUCTION SUMMARY

			P.	WELL CONSTR	RUCTION 5	UNIN	IARI		
			包	LOCATION or COORDS:	ELEVATION: GROUP	ND LEVE	59	77.16	
	ł		D	N 34071.9 E 17104.2		F CASIN		79.15	
			6.						
	<b>-</b> 5		P. (	DRILLING SUMMARY:	CONSTRUCTION	TIME	LOG:		
			1.	TOTAL DEPTH Well: 9.60' Hole: 17.00'		ST.	ART	FIN	IISH
			B	BOREHOLE DIAMETER 5 5/8"	TASK	DATE	IME	DATE	TIME
		∭≣i	2		DRILLING:	1986		1986	
	-10			DRILLER Boyles Brothers Drilling Co.	5 5/8" casing	9/26	<u>0815</u>	9/26	0920
			E	15865 W. 5th Avenue, Golden, CO	advancer			<del> </del>	
				Arrow Drilling, Tom High)	<del></del>		<u> </u>	·	
				RIG Failing 1500	GEOPHYS. LOGGING:	_=_		<u> </u>	
Jer			Ē	BIT(S) Down hole hammer	CASING: 2" stainless	9/26	1500	9/26	1505
Oulliver	- 15			DRILLING FLUID None	2 Stanness			7729	
티				ourses eache 5" v 3 81' steel w/ locking	FILTER PLACEMENT:	9/26	1505	9/26	1530
				SURFACE CASING 5" x 3.81' steel w/ locking cap	CEMENTING:	9/26	1535	9/25	1540
PERSONNEL				WELL DESIGN:	CEVELOPMENT:	9/30	1330	10/2	1130
N N	20		1	BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG	OTHER:			·	
ERS	1			CASING STRING(S): C=CASING S=SCREEN	<u>Bentonite</u>	9/26	1445	9/26	1500
•				0.00' 2.60' C1		9/26	1530	9/26	1535
				2.60'- 9.60' S1					
	-25								
1							<u> </u>	<u> </u>	
	ļ				WELL DEVELOP	MENT			
			1 1		See Well Develo	opment S	Summary	Sheet.	
	_30								
			ll	CASING: CI 2" I.D. Sch. 5 type 316 stain-					·
ايد				less steel, threaded and flush			<del> </del>		
Plant				jointed.		<del></del>			
				2!! T.D. Cal. 5 tons 216 at air					
Rocky Flats	- 35			SCREEN: SI 2" I.D. Sch. 5 type 316 stain— less steel, threaded and flush					
Z				jointed, 0.010" wire wrap screen	COMMENTS:				
Ş				0.25' welded bottom cap.	Water encounter	red at	7.0' du	ring dri	lling.
				CENTRALIZERS Type 304 stainless steel					
	-40			6.33' - 7.55'	Top of stainles	ss stee	L casing	2: 1.99	·
				FILTER MATERIAL 32-42 silica sand	First well cons	struction	on atter	mot fail	ed.
				2.45' - 10.00'	Screen pulled.			•	
1			1	CEMENT Portland Type I	built.			-	·····
	<b>-</b> 45			0.00' - 2.30'					
				OTHER 3/8" bentonite pellets		<del></del>		· · · · · · · · · · · · · · · · · · ·	
				2.30' - 2.45'			·····		
				10.00' - 17.00'		· · · · · · · · · · · · · · · · · · ·			<del></del>
	- 50		Ш	HYDRO-SEARCH RENO-DENVER	CONSULTING HY	DROLO	GISTS	-GEOLO	GISTS

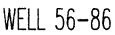
Colden, CO

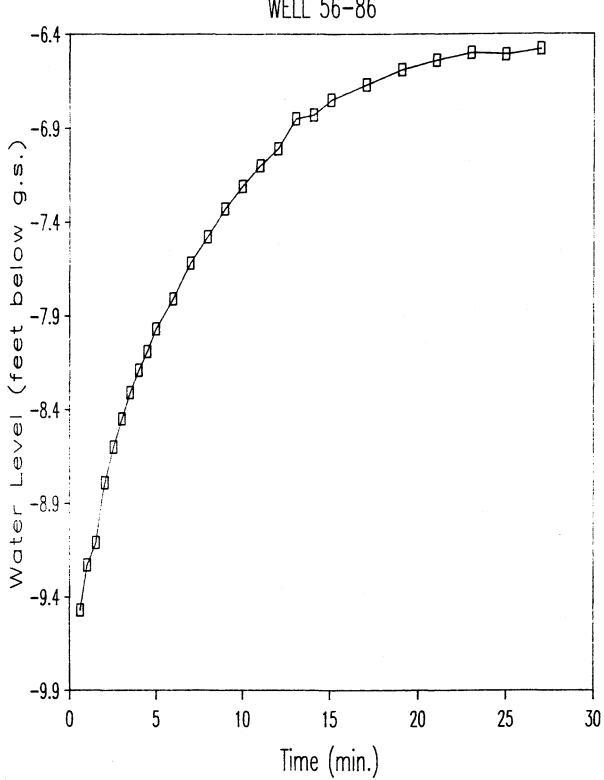
WE	LL	5 <del>6-</del> 86
77		

## WELL DEVELOPMENT SUMMARY

DATE	TIME	METHOD	VOLUME	APPEARANCE	COMMENTS
9-30-86	1330				<pre>1 Well Bore Volume = .52 gals. 10 Well Bore Volumes = 5.2 gals.</pre>
9-30-86	1330	Bailed	2.5 gals.	Moderately turbid medium to dark brown	Clearing to light brown. Recharges moderately well. 2.5/5.2 gals. purged to date
10-1-86	1000	Bailed	3.0 gals.	_	5.5/5.2 gals. purged to date
10-2-86	1130	Bailed	_	Very light brown	Sampled
				·	
					·
					· .
				-	

## AQUIFER TEST DATA





AQUIFER TEST DATA

WELL 56-86

Type of Aquifer Test:

Bail down - Recovery

How Q Measured: 4.5 gallon bucket

How W.L.'s Measured: Olympic Well Sounder

Measuring Point for W.L.'s: Top of Casing

Elevation of Measuring Point: 5987.74

Depth of pump/airline:

Start bai ling: 10/01/86 Stop bailing: 10/01/86

Time: 1140:00 Time: 1153:00

Duration of Aquifer Test:

40 minutes

TIME

at t' = 0

WATER LEVEL DATA

CONNENTS

Static Water Level: 6.16

Project No.: 106P06222

Location: Rocky Flats Plant

Personnel: W.Herst, M. Bergman

t = 13ť t Water Drawdown Level Total Depth = 9.38' 13.0 0 13.6 .6 9.47 3.31 14.0 9.23 3.07 1.0 14.5 1.5 9.11 2.95 15.0 2.0 8.79 2.63 15.5 2.5 8.60 2.44 16.0 8.45 2.29 3.0 16.5 3.5 8.31 2.15 17.0 4.0 8.19 2.03 17.5 4.5 8.09 1.93 18.0 5.0 7.97 1.81 19.0 6.0 7.81 1.65 20.0 7.0 7.62 1.46 21.0 8.0 7.48 1.32 22.0 7.33 9.0 1.17 23.0 10.0 7.21 1.05 24.0 7.10 .94 11.0 25.0 7.01 12.0 . 85 26.0 6.85 .69 13.0 27.0 6.83 .67 14.0 28.0 15.0 6.75 .59 30.0 .51 17.0 6.67 32.0 19.0 6.59 .43 34.0 21.0 6.54 . 38 36.0 . 34 23.0 6.50 38.0 25.0 6.51 .35 40.0 90% recovered at 6.48° 27.0 6.48 .32

Page No. 12/11/87

100

Water Leve

#### Water Level Data for Rockwell (Rocky Flats)

Date Measured 	Depth to Water from TOC	Elevation TOC (ft)	Water Level Elev. (ft)	
** Well Number:	5686			
09/30/86	8.01	5979.15	5971.14	
10/01/86	8.03	5979.15	5971.12	
10/02/86	7.97	5979.15	5971.18	
10/13/86	6.33	5979.15	5972.82	
11/26/86	6.69	5979.15	5972.46	
01/01/87	6.83	5979.15	5972.32	
05/08/87	5.02	5979.15	5974.13	
06/02/87	6.61	5979.15	5972.54	
07/07/87	6.73	5979.15	5972.42	
07/14/87	6.80	5979.15	5972.35	
08/03/87	7.50	5979.15	5971.65	
09/29/87	34.40	5979.15	5944.75	
11/09/87	6.90	5979.15	5972.25	

#### INDEX OF DATA

Boring	No.: 62-86	-
Comple	eted as well? Yes	
Data in	n File	
<u> </u>	Log of Borehole	
<u> </u>	Well Construction Summaries	
<u> X</u>	Well Development Summaries	
<u> X</u>	Hydraulic Conductivity Test Data	
	and Results	
	Packer Test Data and Results	
X	Water Level Data	

Project:

Rocky Flats Plant

## LOG OF BORING NO.

62-86

Date Drilled 9/25/86

106P06222

Boring Method Hollow Stem Auger

Coordinates N 35154.3

**Ground Surface Elevation** 

E 22613.2 5897.54

Page 1 of 3

Elev. (feet)	Depth (feet)	Semple Graphi Type Log	Material Description	Penetration Resistance (Blows/Inch) 20 40		Other Tests
	0	//	COLLUVIUM	<del>                                     </del>	1777	
		<b>(//</b>	0-0.5'-Sample.		-	1
		///==	Recovered 0.5/0.5'=100%.	1	1	1
•	1 -	///===	CLAY: dusky yellowish brown (10YR 2/2); silty;	1	· •	1
	-	<b>///</b>	some granitic pebbles and		1	
	-	<b>//</b>	<pre>small cobbles; poorly sorted; unconsolidated;</pre>		<b>,</b>	
		//	dry.		-	
	-	//	0.5-4.8'-Sample. Recovered 3.7/4.3'=86%.	j		
		//	CLAY: dusky yellowish		7	
<b>[</b> ]	-		brown (10YR 2/2) and moderate yellowish brown	1		
1 1	<b>-</b> 5 <b>-</b>		(10YR 5/4); silty; trace			
1 1	-		of small granitic cobbles; poorly sorted;		-	
1 1			consolidated; damp.		-	
1 1	-		4.8-7.5'-Sample. Recovered 1.6/2.7'=59%.	1	-	
1 1	-	//	CLAY: Same as above; damp.	1	-	
1 1	4		7.5-10.5'-Sample.		-	
<b>!</b> !	-	///	Recovered 3.0/3.0'=100%. CLAY: Same as above;		-	
	-		- moist.	1		
i i	4	//	10.5-12.7'-Sample. Recovered 1.3/2.2'=59%.	1		
1 1	4	///===	CLAY: Same as above;	1		
	<del>-</del> 10 -		moist. /12.7-14.0'-Sample.	4 1		
1 1	4	<b>//Æ</b>	Recovered 0.6/1.3'=46%.	1		
	-	///==	GRAVEL: moderate brown   (5YR 4/4); granitic	]	4	
	4	//	pebbles and cobbles; some		4	
	-	///==	clay and sand; poorly sorted; unconsolidated;			
	4	///	wet.	1 I	4	
	+		/14.0-14.5'-Sample. /Recovered 0.5/0.5'=100%.	] [	4	
	4	// 10.00			4	
		فمر//	(5Y 6/1); mottled iron staining; unconsolidated;	1	4	f
1	4	//	moist. 14.5-17.8'-Sample.	]	. 4	
F	—i5 —		Recovered 1.6/3.3'=48%.	1 1	4	
1	4	///==	CLAY: moderate brown (5YR		4	
I	4	//	4/4); silty; trace of small granitic cobbles;	1	4	
i	4	//	<pre>poorly sorted; unconsolidated; moist.</pre>	1	4	
I	4	///==	/17.8-20.3'-Sample.	4 . 1	4	
I	4	///	Recovered 1.0/2.5'=40%.	] ;	4	
	4	// 25 00	GRAVEL: moderate brown (5YR 4/4); granitic	1	4	
	4	// 1.0.9	pebbles and cobbles, some	1	4	1
I	_ <b>-</b> }	// <b>j</b> .0%	sand and micaceous clay; poorly sorted;		4	
	1	1000	unconsolidated; wet.		4	j
	20	//!ngs	<u> </u>		<del></del>	
Remar	ks .	Logged by: I	Pivonka		Checked by:	MA
Projec	ct No.		Hydro-Search	Inc		

Hydro-Search, Inc.

Project: Rocky Flats Plant

## LOG OF BORING NO.

62-86

Date Drilled 9/25/86

Boring Method Hollow Stem Auger

Coordinates N 35154.3

E 22613.2

**Ground Surface Elevation** 

5897.54

Elev. Depth Sample Graphic (feet) Type Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Coffent	Other Tests
20 - 20	20.3-22.0'-Sample. Recovered 0.9/1.7'=53%. GRAVEL: Same as above;			
7/000	wet.		-	
	ARAPAHOE FORMATION		-	
	22.0-22.8'-Sample. Recovered 0.3/0.8'=38%.			
	CLAYSTONE: light olive gray (5Y 6/1) and dark		-	
	yellowish orange (10YR 6/6); weathered; consolidated; moist.			
_25_	22.8-25.3'-Sample.			·
1 1//	Recovered 2.0/2.5'=80%. CLAYSTONE: Same as above; moist.		$\nabla$	
	25.3-27.8'-Sample.			
	Recovered 1.5/2.5'=60%. SANDTONE: light olive		-	
	gray (5Y 6/1) and dark yellowish orange (10YR			
-//	6/6); weathered; well sorted; moderately well		-	
	cemented; moist.  27.8-30.3'-Sample.			
<b>-30 -3</b> /	Recovered 2.5/2.5'=100%. SANDSTONE: Same as above:		-	
	moist.			
	30.3-32.8'-Sample. Recovered 2.5/2.5'=100%.		· =	
	SANDSTONE: Same as above; moist.			
	32.4-34.5'-Sample. Recovered 2.3/2.3'=100%.			
-//	SANDSTONE: Same as above; moist.		4	
	34.5-35.4'-Sample. Recovered 0.9/0.9'=100%.		1	1
<b>—</b> 35 <b>—</b>	CLAYSTONE: medium gray (N 5) and dark yellowish			1
	orange (10YR 6/6); some fine-grained sand;		1	
	<pre>weathered; consolidated; damp.</pre>		4	
	35.4-37.9'-Sample. Recovered 2.5/2.5'=100%.		j	
	CLAYSTONE: Same as above; damp.		4	
	37.9-40.4'-Sample.	ĺ		
	Recovered 2.0/2.5'=80%. CLAYSTONE: Same as above;			
40 7	damp.			-

Project:

Rocky Flats Plant

## LOG OF BORING NO.

62-86

Date Drilled 9/25/86

N 35154.3 Coordinates

E 22613.2

Boring Method Hollow Stem Auger **Ground Surface Elevation** 5897.54

<b>—</b>		<del></del>			30,7.04	
Elev. (feet)	Depth (feet)	Gemple Grephic Type Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Content	Other Tests
	40		40.4-42.9'-Sample.			
	] 7		Recovered 2.5/2.5'=100%.		1 7	Ţ
	T -	<b>/</b> //	SANDSTONE: medium gray (N 5); some iron staining;		, T	1
	<b>∣</b> ⊢	///	plant fossils; well		1 -	1
	1 -	// /	sorted; weathered; consolidated; damp.		1 -	Ţ
<b>,</b>	4	///	•		1 -	Ţ
1 1	_	///	42.9-45.4'-Sample.		1 4	
ĭ 1	ل ا	//	Recovered 2.5/2.5'=100%. SANDSTONE: Same as above;	1	اـ ا	
[ ]		//	damp.		]	Ī
1 J			45.4-47.9'-Sample.		7	1
1 1	<b>_</b>		Recovered 2.5/2.5'=100%.		, <b>1</b>	
į į	45-		SANDSTONE: medium gray (N 5) and dark yellowish	1	1 -1	
1 I	-		orange (10YR 6/6); some	1 1	1 -1	1
1 I	-	///	iron staining; plant	1	· -	
1 1	4		fossils; interbedded claystone beds 1.0"	1	1	·
Į I	<u> </u>		thick; weathered; well	1		
1 I	J		sorted; consolidated;	1		
1. 1	7	//	damp.	1		
	7	//===	47.9-50.0'-Sample.	1 )	7	
	1	//譯	Recovered 2.1/2.1'=100%.	1 1	1	
1	4	//譯	CLAYSTONE: medium gray (N 5) and dark yellowish	1 1	-	
	4	<b>//</b> 建封	orange (10YR 6/6); sandy;	1 1	· ,	
<b> </b>	<b>—</b> 50 <b>—</b>	//	iron staining; plant fossils; weathered;	1	4	
	1	//	\fossils; weathered; \consolidated; damp.	1	4	
		//		1 1	ل	
	. 1	//	50.0-52.8'-Sample. Recovered 2.8/2.8'=100%.	( )	J	
ı	1	//	SANDSTONE: olive gray (5Y	1 1	7	1
1	7		4/1); fine to medium-	, ,	1	
ı	7		<pre>grained; clayey; mottled iron staining; well</pre>	, ,	1	1
1	-		sorted; consolidated;	q I	4	•
1	4		moist.	1	4	1
1	4	///	52.8-55.3'-Sample.	1	4	1
j	1	//	Recovered 2.5/2.5'=100%.	<b>,</b> 1	4	1
L	_ 55 _	//	SANDSTONE: olive gray (5Y 4/1); medium-grained sand;	1 1	Ĺ	1
ſ		//	4/1); medium-grained sand; clay laminae; well sorted;	1	1	1
1	7		consolidated; moist to	<b>,</b> 1	7	
1	7		wet.	7 1	1	
I	1		55.3-57.8'-Sample.	1	1	
I			Recovered 2.0/2.5'=80%.	1	4	I
1	4		SANDSTONE: Same as above; wet.	1	4	
I	<b>→</b>		57.8-59.3'-Sample.	<b>,</b> 1	4	
1	1		Recovered 1.5/1.5'=100%.	<b>,</b>	4	
			SANDSTONE: Same as above;	1	L	
I			TOTAL DEPTH: 59.5'	1		
	60		one thi 33.3.			+
Remar	ks	Logged by: L.	Pivonka		Checked by:	展

Project No.

106P06222

Hydro-Search, Inc.

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ME1	62-86

CONSULTING HYDROLOGISTS-GEOLOGISTS

WELL CONSTRUCTION SUMMARY 5897.54 ELEVATION: GROUND LEVEL -LOCATION or COORDS: _ 5898.75 N 35154.3 E 22613.2 TOP OF CASING -CONSTRUCTION TIME LOG: DRILLING SUMMARY: START FINISH TOTAL DEPTH Well: 35.19' Hole: 59.25' TASK DATE TIME DATE TIME BOREHOLE DIAMETER ___ 1986 1986 DRILLING: 1048 10/2 1359 DRILLER Boyles Brothers Drilling Co. 7½" auger 9/25 -20 15865 W. 5th Avenue Golden, CO (Jim Horn) Mobile B-57 GEOPHYS. LOGGING: RIG ___ Blade bit CASING: BIT(S) __ 1408 10/2 2" stainless 10/2 1405 _30 DRILLING FLUID ____None 10/2 1408 10/2 1425 SURFACE CASING 5" x 4' steel w/ locking FILTER PLACEMENT 1615 10/2 1636 10/2 CEMENTING: PERSONNEL 10/16 WELL DESIGN: 10/5 1610 0940 LEVELOPMENT: 40 BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG ____ OTHER: 10/2 1431 1425 10/2 Bentonite CASING STRING(S): C=CASING S=SCREEN 1359 10/2 10/2 1405 0.00' 25.22' C1 | 25.22'- 35.19' SI -50 WELL DEVELOPMENT See Well Development Summary Sheet. CASING: C1 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush iointed. ant SCREEN: SI 2" I.D. Sch. 5 type 316 stain-Pl Flats <del>-</del> 70 less steel, threaded and flush COMMENTS: jointed, 0.010" wire wrap screen Water encountered at 25.30' during drilling 0.25' welded bottom cap. CENTRALIZERS Type 304 stainless steel Top of stainless steel casing: 1.21' 29.31' - 30.50' -80 FILTER MATERIAL __32-42 silica sand <u> 24.00' - 35.50'</u> CEMENT Portland Type I 0.00' - 23.00' 37.00' - 59.30' - 90 OTHER _ 3/8" bentonite pellets 23.00' - 24.00' 35.50' - 37.00' 100

HYDRO-SEARCH RENO-DENVER

## WELL DEVELOPMENT SUMMARY

DATE	TIME	METHOD	VOLUME	APPEARANCE	COMMENTS
10-6-86	1610				<pre>1 Well Bore Volume = 1.4 gals. 10 Well Bore Volumes = 14.4 gals.</pre>
10-6-86	1610	Airlifted	1.4 gals.	Light brown mist	None
10-7-86	1530	Bailed	1.8 gals.	Light brown, slightly turbid	1.8/14.4 gals. purged to date
10-8-86	1425	Bailed	2.0 gals.	Very light brown, slightly turbid	3.8/14.4 gals. purged to date
10-9-86	1230	Bailed	2.0 gals.	Light to very light brown	5.8/14.4 gals. purged to date
10 <del>-9-</del> 86	1700	Bailed	1.5 gals.	Light brown to clear	7.3/14.4 gals. purged to date
10-10-86	0835	Bailed	2.0 gals.	Clear	9.3/14.4 gals. purged to date
10-10-86	1100	Bailed	1.5 gals.	Clear, slightly turbid	10.8/14.4 gals. purged to date
10-10-86	1540	Bailed	2.0 gals.	Clear, slightly turbid	12.8/14.4 gals purged to date
10-14-86	1045	Bailed	2.0 gals.	Clear, slightly turbid	14.8/14.4 gals. purged to date
10-15-86	1040	Bailed	2.0 gals.	Clear, slightly turbid	16.8/14.4 gals. purged to date
101686	0940	Bailed		Clear, slightly turbid	Sampled
		·			
				·	
					·

#### PROGRAM SLUGT, VERSION 4,007. 1985

THIS PROGRAM CALCULATES MEAN TRANSMISSIVITIES FROM SLUG-TEST DATA BASED ON TWO ANALYTICAL APPROACHES:

- (1) METHOD OF COOPER, BREDEHOEFT AND PAPADOPULOS, 1967 (ARTICLE IN VOL.3, NO.1 OF WRR ENTITLED "RESPONSE OF A FINITE DIAMETER WELL TO AN INSTANTANEOUS CHARGE OF WATER")
- (2) METHOD OF BOUWER AND RICE, 1976 (ARTICLE IN VOL. 12, NO.3 OF WRR ENTITLED *A SLUG TEST FOR DETERMINING HYDRAULIC CONDUCTIVITY OF UNCONFINED AQUIFERS WITH COMPLETELY OR PARTIALLY PENETRATING WELLS")

PROJECT NO.: 6-0118-87

CLIENT: Rockwell International

ITE LOCATION: Rocky Flats Plant

DATE OF SLUG TEST: 10-15-87

FIELD INVESTIGATOR: Kevin McNeill

WELL NO.: 62-86

INPUT DATA ARE:

INNER CASING DIAMETER = 2.00 INCHES INNER SCREEN OR OPEN-HOLE DIAMETER = 2.00 INCHES DIAMETER OF DRILLED HOLE = 7.25 INCHES ESTIMATED POROSITY OF GRAVEL PACK = .25

LENGTH OF SCREEN OR INTAKE PORTION = 9.97 FEET DEPTH FROM STATIC LEVEL TO BOTTOM OF SCREEN = 10.92 FEET THICKNESS OF SATURATED AQUIFER IDNE = 10.23 FEET FALLING-HEAD INDEX = 0 ("1" IF FALLING, "0" IF RISING) NUMBER OF HEAD-TIME DATA POINTS = 42

TIME	HEAD
(sec )	(FEET
1.00	.840
2.00	. B40
3.00	. 540
4.00	. 830
5.00	. 830
6.00	. 830
7.00	. 830
8.00	. 830
9.00	. 820
10.00	. 820
11.00	. 820
12.00	. 820
13.00	.820
14.00	.820
15.00	.810
16.00	.810
17.00	.810
18.00 19.00	.810 .810
20.00	.810
52.00	.800
82.00	.790
112.00	.780
172.00	.770
232.00	.750
292.00	.740
352.00	.730
412.00	.720
472.00	.710
532.00	.700
652.00	. 690
772.00	.670
892.00	.660
1042.00	. 640
1222.00	.620
1402.00	. 600
1582.00	. 590
1762.00	.570
1942.00	.560
2122.00	.550
2302.00	.540
2542.00	. 520

HO WAS COMPUTED FROM INTERCEPT OF PLOT OF LOG(H) VS. TIME

SUCCESSIVE COMPUTED VALUES FOR HO (FEET)

> .8101 .8112

#### METHOD OF BOUNER AND RICE

COMPUTED RESULTS USING DIAMETER OF DRILLED HOLE:

PERMEABILITY = 1.88E-07 FT/sec = 5.73E-06 CM/sec

TRANSMISSIVITY = 1.92E-06 FT++2/sec

COMPUTED RESULTS USING DIAMETER OF CASING AND SCREEN:

PERMEABILITY = 2.64E-07 FT/sec = 8.03E-06 CM/sec

TRANSMISSIVITY = 2.70E-06 FT##2/sec

### Water Level Data for Rockwell (Rocky Flats)

Date Measured	Depth to Water from TOC	Elevation TOC (ft)	Water Level Elev. (ft)
** Well Numbe	r: 6286		
10/06/86	27.90	5898.75	<b>58</b> 70.85
10/07/86	27.91	5898.75	5870.84
10/08/86	27.98	5898.75	5870.77
10/10/86	28.00	5898.75	5870.75
10/13/86	27.83	5898.75	<b>5870.</b> 92
10/14/86	27.89	5898.75	5870.86
10/15/86	28.03	5898.75	5870.72
10/16/86	27.99	5898.75	5870.76
11/26/86	27.92	5898.75	5870.83
01/01/87	27.96	5898.75	5870.79
05/07/87	27.83	5898.75	5870.92
06/02/87	27.10	5898.75	<b>5871.6</b> 5
06/24/87	27.16	5898.75	5871.59
07/06/87	26.50	5898.75	5872.25
08/06/87	26.00	<b>5898.</b> 75	5872.75
09/02/87	25.80	5898.75	5872.95
10/05/87	25.70	5898.75	5873.05
12/01/87	25.90	5898.75	<b>5872.8</b> 5

#### **INDEX OF DATA**

Boring No.: 63-86	Boring					
Completed as well? Yes	Comple					
Data in File						
X Log of Borehole	<u>X</u>					
X Well Construction Summaries	<u> </u>					
X Well Development Summaries	<u> </u>					
Hydraulic Conductivity Test Data						
and Results						
Packer Test Data and Results						
X Water Level Data	<u>X</u>					

Project:

Rocky Flats Plant

## LOG OF BORING NO.

63-86

Date Drilled 9/26/86

Boring Method Hollow Stem Auger

Coordinates N 35156.0 E 22641.5 Ground Surface Elevation 5896.55

Boring Method Rollow Stem Alger Ground Suitace Elevation 3030.33						
Elev. (feet)	Depth (feet)	Sample Grad		Penetration Resistance (Blows/Inch) 20 40		Other Tests
	0	//==	COTTOAION			
	_		0-0.5'-Sample.			
	_		Recovered 0.5/0.5'=100%. CLAY: dusky yellowish			
l i	_		brown (10YR 2/2); silty;			
	_		some small granitic cobbles; poorly sorted;	1		
	-		unconsolidated; damp.			
	-		o s. a st. Cample			
	_		0.5-3.8'-Sample. Recovered 0.4/3.3'=12%.			
	_		CLAY: dark yellowish			
ł	_		orange (10YR 6/6); silty; trace granitic pebbles;			
}	5 —		poorly sorted;		-	
	-	//E	unconsolidated; damp.		-	
		//==	3.8-5.8'-Sample.	ļ		
			Recovered 1.0/2.0'=50%. CLAY: Same as above;		-	
			damp.	·	_	
	_		5.8-7.3'-Sample.		_	
	_		Recovered 1.5/1.5'=100%.			
l	_		CLAY: Same as above;		-	
					-	
			7.3-9.8'-Sample. Recovered 1.2/2.5'=48%.		_	
	10	<b>/</b> /壁	CLAY: Same as above;			
	10		글 moist.		-	
			9.8-12.3'-Sample.		_	
			Recovered 2.0/2.5'=80%.			
			CLAY: Same as above;			
	-		12.3-14.2'-Sample. Recovered 1.5/2.0'=80%.			
			CLAY: Same as above;	i i		
			-1 moist. 14.8-17.3'-Sample.	i	$\nabla$	
I			Recovered 2.5/2.5'=100%.	[.		
	1	100	14.4-14.8'. GRAVEL:		7	
<b> </b>	<b>—</b> 15 <b>—</b>		moderate yellowish brown		-1	
į			(10YR 5/4) and grayish orange (10YR 7/4);	1	7	
	-	//==	granitic pebbles and	]	-1	
	-1		cobbles; sandy; poorly sorted; unconsolidated;	<b>!</b>	4	
		<b>//</b>	moist to wet.		4	
	4		ARAPAHOE FORMATION	ł	-	
I	-			l I		
l	4		14.8-17.3'. CLAYSTONE: light olive gray (5Y 6/1);		-	
	$\dashv$		mottled iron staining;	1		
	<u> </u>		consolidated; moist. TOTAL DEPTH: 17.3'	, , , , <b> </b>		
Remar		Logged bus	L. Pivonka		Checked by:	420
		mager ny:	T. TYOUNG		GECKEU DY	<i>x</i> − <i>x</i> −
Projec			Hydro-Search	Inc.	Page 1 of 1	
106P06222			11,410 0041011,	Hydro-Search, Inc.		

WELL	63-86	

		r					WELL CONSTR	SUCTION S	UMM	ARY												
		ı					LOCATION or COORDS:	ELEVATION: GROUP	ND LEVEL	58	96.55	1										
						=	N 35156.0 E 22641.5		F CASIN		97.48											
			2			==				<del> </del>												
		r													薑		DRILLING SUMMARY:	CONSTRUCTION	TIME	LOG:		
						==	TOTAL DEPTH Well: 15.50' Hole: 17.30'	TACK	<u>\$7</u>	ART	FIN	IISH										
							BOREHOLE DIAMETER	TASK	<u>DATE</u> 1986	TIME	<b>DATE</b> 1986	TIME										
								DRILLING:			ł											
		1	4	░			DRILLER Boyles Brothers Drilling Co.	7½" auger	9/26	1630	9/29	1205										
	-			∦≣		==	15865 W. 5th Avenue Golden, CO (Jim Horn)															
	-			∄≣		==	RIG Mobile B-57	GEOPHYS. LOGGING:														
				∄≣		=	BIT(S) Blade bit	CASING:														
8	휥	L	5	∄≣		呂	B11(3)	2" stainless	9/29	1221	9/29	1223										
eu	Pivonka	[		∄≣			DRILLING FLUID None															
Golden,	1.			1≣																		
		l		∄		吕	SURFACE CASING 5" x 4' steel w/ locking cap	FILTER PLACEMENT	9/29	1223	9/29	1235										
	<u>ا</u>			1			WELL DESIGN:	CEMENTING:	9/29	1237 1610	9/29 10/6	1240 1610										
<u>N</u>	N	۶ ا	3	ΙĒ				CEVELCPMENT:	10/0	1010	10/0	1010										
LOCATION	PERSONNEL			ΙĒ		莒	BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG CASING STRING(S): C=CASING S=SCREEN	OTHER: Bentonite	9/29	1220	9/29	1221										
2	Ā			1≣	K		0.00' 3.80' Cl		9/29	1235	9/29	1237										
				I≣			3.80' - 15.25' S1 -															
		-10																				
,	1			Ī																		
I						3		WELL DEVELOP	MENT													
				∄				See Well Develo	nment S	umarv	Sheet.											
		_12		1		퐄		oce well bevelo	phene c	Chillest y	once.											
		<b>7</b> 2		I		当	CASING: CI 2" I.D. Sch. 5 type 316 stain-															
						==	less steel, threaded and flush															
	ant			3		3	jointed.															
	Rocky Flats Plan					3																
3	ats	_14		≣		긐	SCREEN: SI 2" I.D. Sch. 5 type 316 stain-															
3	K					a	less steel, threaded and flush jointed, 0.010" wire wrap screen,	COMMENTS:														
3	첽			[≣			0.25' welded bottom cap.	Water encounter	ed at 1	4' duri	ng dril	ling.										
	٣1					킄	CENTRALIZERS Type 304 stainless steel	water encoureer	ca ac .	<u>, , , , , , , , , , , , , , , , , , , </u>		22.51										
		_16				3	8.93' - 10.15'	Top of stainles	s steel	casing	. 0.93	1										
-						킄																
						3	FILTER MATERIAL 32-42 silica sand															
2	H					크	3.00' - 15.80'	<del></del>														
	ı				- 1	-	CEMENT Portland Type I															
	l	-18					OTHER 3/8" bentonite pellets															
							2.00' - 3.00'															
							15.80' - 17.30'															
	-	<b>-2</b> 0				r	INDRA OFARCH															
	L						HYDRO-SEARCH RENO-DENVER	CONSULTING HY	DROLO	GISTS-	-GEOLO	GIST										

WELL	63-86	
**		

## WELL DEVELOPMENT SUMMARY

10-6-86 1610 — — — — — — — — — — — — — — — — — — —

#### Water Level Data for Rockwell (Rocky Flats)

Date Measured	Depth to Water from TOC	Elevation TOC (ft)	Water Level Elev. (ft)	
** Well Numbe	r: 6386			
10/06/86	-1.00	5897.48		
10/13/86	-1.00	5897.48		
11/26/86	-1.00	5897.48		
01/01/87	-1.00	5897.48		
05/07/87	-1.00	5897.48		
06/02/87	-1.00	5897.48		
06/24/87	-1.00	5897.48		
07/ <b>06/87</b>	-1.00	5897.48		
08/06/87	-1.00	5897.48		
09/02/87	-1.00	5897.48		
10/05/87	-1.00	5897.48		
11/09/87	-1.00	5897.48		
12/01/87	-100	5897 48		

## INDEX OF DATA

Boring	g No.: 64-86						
Comple	ted as well? Yes						
Data in	Data in File						
<u>X</u>	Log of Borehole						
<u> </u>	Well Construction Summaries						
<u>X</u>	Well Development Summaries						
	Hydraulic Conductivity Test Data						
	and Results						
	Packer Test Data and Results						
X	Water Level Data						

Project:

Project No.

106P06222

Rocky Flats Plant

## LOG OF BORING NO.

64-86

Date Drilled 9/10/86

Boring Method Hollow Stem Auger

Coordinates N 34683.8 E 22497.3

Ground Surface Elevation 5834.48

Bori	ng Meti	l Dou	follow S	tem Auger Ground St	iriace Elevat	10n 5834.48	
Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	Content	Other Tests
	0 -		0.00	VALLEY FILL ALLUVIUM			
	_		000	0-2.0'-Sample.		-	
			0.0	Recovered 2.0/2.0'=100%. GRAVEL: grayish brown			
			000.0	(5YR 3/2); granite and quartzite pebbles and			
			200	cobbles; some silty and			
			္ပံုိင္ငံ	<pre>sand; poorly sorted; angular to subrounded;</pre>			
	4		0.0	unconsolidated; dry.	l	] 4	
	4			3.0'-Cuttings. GRAVEL: Same as above; dry.		-	
1 1	2-		0.00	_		-	
	│ <b>┤</b>			3.3-4.0'-Sample. Recovered 0.7/1.7'=41%.	ł	-	
	1		) 0°	GRAVEL: Same as above; dry.	1		
	ゴ		$\mathcal{O}_{\mathcal{O}}$	4.0-6.0'-Sample.		ı	
	7		· 98	Recovered 2.0/2.0'=100%. GRAVEL: pale brown (5YR		_	
. !			0.00	5/2); granite and		-	
	-			quartzite pebbles and cobbles; some silt and			
	-		O. O	<pre>sand; grades downward into yellowish gray (5Y 7/2)</pre>	:	4	
	1		000	silty sand; angular; unconsolidated; dry.		٦	f
	<b>-</b> 4 <b>-</b>		0.8	unconsolidated; dry.		]	
	J		$\Diamond \bigcirc_{i}$				
	1					4	
	-		200			-	-
			ر. از چې			-	
	-		000			-	
	1	//	388			-	
			36.6				
	_ ,		7,00				
	$\overline{}$		5.00	6.0-8.0'-Sample.			
	4			Recovered 0.6/2.0'=30%. GRAVEL: moderate		4	
	4	<b>//</b> }	00	yellowish brown (10YR 5/4); granite and			
f	-1		J. 23	quartzite pebbles and cobbles; sandy to clayey;		4	
I	1		200	poorly sorted; unconsolidated; angular;		4	
1	7		0.0	dry.	İ	j	
1	<b>1</b>		0.00°			]	
j	A		°0°0				
	8	<u> </u>				<del></del>	
Remar	K B	rogged	by: J.	Bergnan		Checked by:	WXX.

Hydro-Search, Inc.

Page 1 of 2

Project: Rocky Flats Plant LOG OF BORING NO.

Date Drilled 9/10/86

Boring Method Hollow Stem Auger

Coordinates N 34683.8 E 22497.3

Ground Surface Elevation 5334.48

Elev. De (feet) (fe	 de Graphic e Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	Conjent 20 40	Other Tests
		**Recovered 2.0/2.0'=100*.  **Recovered 2.0/2.0'=100*.  **S.0-8.8'. CLAY: greenish gray (5GY 6/1) and moderate yellowish brown (10YR 5/4); trace granitic pebbles; poorly sorted; unconsolidated; dry.  **ARAPAHOE FORMATION**  **S-10.0'. CLAYSTONE: greenish gray (5GY 6/1) and moderate yellowish brown (10YR 5/4); homogenous; some black organic fragments; consolidated; dry.  10.0-12.0'-Sample.  Recovered 2.0/2.0'=100*. CLAYSTONE: moderate yellowish brown (10YR 5/4) with some greenish gray (5GY 6/1) clay; homogenous; consolidated; dry.  12.0-14.0'-Sample.  Recovered 2.0/2.0'=100*. CLAYSTONE: moderate yellowish brown (10YR 5/4) with some greenish gray (5GY 6/1) clay; homogenous; consolidated; dry.  TOTAL DEPTH: 14.0'	Resistance (Blows/inch)	(%)	Other Tests
16					
Remarks	 ed by: J.	Beroman		Checked by:	JA
Project N	, = = -, - 30				

Project No. 106P06222

Hydro-Search, Inc.

Page 2 of 2

WELL	64-86	
W11	0-1 00	

	<b>-</b> 0				Ų,	WELL CONSTR	RUCTION S	UMM	ARY		
					0		ELEVATION: GROUI	אחי בעבו	583	34.48'	
					~	N 34683.8 E 22497.3		F CASIN	50	36.46'	
	l				325						
1	<b>-</b> 2				13	DRILLING SUMMARY:	CONSTRUCTION	TIME	LOG:		
					5%	TOTAL DEPTH Well: 9.00' Hole: 14.00'		<u>\$1</u>	ART	FIN	<u>ISH</u>
					°	BOREHOLE DIAMETER 74"	TASK	DATE	TIME	DATE	TIME
	1		lΞ		3:	BOREHOLE BIAMETER	DRILLING:	1986		1986	
	_,				.9	DRILLER Boyles Brothers Drilling Co.	7년'' auger	9/10_	_1130_	9/10	1330
	Γ" ,		I		3	15865 W. 5th Avenue					
			≣		o	Golden, CO (Tony Robinson)					
			Ī	Λ	6	RIG Acker	GEOPHYS. LOGGING:	_=_			
					Q _o	BIT(S) T5	CASING:  2" stainless	9/10	1515	9/10	1520
pergnan	-6	N	Ξ	1	d	DRILLING ELLID None					
8			≣		2	DRILLING FLUID None					
ᆌ			≣		Ö	SURFACE CASING 5" x 4' steel w/ locking	FILTER PLACEMENT	9/10	1520	9/10	1525
1			≣		5:		CEMENTING:	9/10	1535	9/10	1545
W.	_8		Ξ		ည်ရှိ	WELL DESIGN:	LEVELOPMENT:	9/13	1215	9/13	1215
PERSONNEL			Ξ		=	BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG	OTHER:	0/10	1505	0/10	1530
E E			Ξ		弖	CASING STRING(S): C=CASING S=SCREEN	<u>Bentonite</u>	9/10 9/10	<u>1525</u> _1510_	9/10 9/10	1515
•						0.00' 3.41' C1		9/10	_1210_	9/10	
						3.41' - 9.00' SI					
	10				当						
1											<del></del>
							WELL DEVELOF	MENI			
	⊣2						<u>See Well Develo</u>	opment S	Summary	Sheet.	
						CASING: CI 2" I.D. Sch. 5 type 316 stain-		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	<del></del>		
ال						less steel, threaded and flush	<del></del>	·			<del></del>
<b>E</b>						jointed.			·.·- · <del>-</del>		
S	_14					SCREEN: SI 2" I.D. Sch. 5 type 316 stain-					
Rocky Flats Plant	<u> </u>					less steel, threaded and flush	COMMENTS				
ş						jointed, 0.010" wire wrap screen	COMMENTS:				
ğ						0.25' welded bottom cap.	No water encou	ntered o	during d	rilling	<u></u>
						CENTRALIZERS Type 304 stainless steel	Top of stainle	an atoo	Longino	. 1 08	<u> </u>
	<b>⊣</b> 6					4.81' - 6.31'	10p of stame	ss stee.	L Casing	. 1.90	
						32-/2 oilies card					
						FILTER MATERIAL 32-42 silica sand 2.50' - 9.25'					
١						CEMENT Portland Type I					
	-18					0.00' - 2.00'					
	70					OTHER 3/8" bentonite pellets			<u> </u>		
						2.00' - 2.50'		i			
						9.25' - 14.00'					
	-20					HYDRO-SEARCH RENO*DENVER	CONSULTING H	YDROL	OGISTS	-GEOL	OGIST:
						THE THE WORLD STREET					

8

Golden,

LOCATION

WELL 64-86	
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## WELL DEVELOPMENT SUMMARY

DATE	TIME	METHOD	VOLUME	APPEARANCE	COMMENTS
9-13-86	1215	_			<u>Dry</u>
			· · · · · · · · · · · · · · · · · · ·		
<u> </u>					
		·			
	·				
					·

### water Level Data for Rockwell (Rocky Flats)

86		
-1.00 11.27 6.98 7.27 7.02 9.60 9.50 -1.00 7.70 10.70 10.60 10.60 10.50	5836.46 5836.46 5836.46 5836.46 5836.46 5836.46 5836.46 5836.46 5836.46 5836.46	5825.19 5829.48 5829.19 5829.44 5826.86 5826.96 5825.76 5825.76 5825.86 5825.86 5825.86
	11.27 6.98 7.27 7.02 9.60 9.50 -1.00 7.70 10.70	-1.00 5836.46 11.27 5836.46 6.98 5836.46 7.27 5836.46 7.02 5836.46 9.60 5836.46 9.50 5836.46 -1.00 5836.46 10.70 5836.46 10.60 5836.46 10.60 5836.46

#### INDEX OF DATA

Boring No.: 65-86					
Comple	ted as well? Yes				
Data in	File				
<u> </u>	Log of Borehole				
<u> </u>	Well Construction Summaries				
<u>X</u>	Well Development Summaries				
<u>X</u>	Hydraulic Conductivity Test Data				
	and Results				
	Packer Test Data and Results				
X_	Water Level Data				

Project: Ro

Rocky Flats Plant

## LOG OF BORING NO.

65-86

Date Drilled 9/13/86

Boring Method Hollow Stem Auger

Coordinates N 34886.7 E 24389.5 Ground Surface Elevation 5782.75

Boring Method Hollow Stem Auger Ground Surface Elevation 5782.75							
Elev. Depth (feet) (feet)	Sample Graphic Type Log	Material Description	Penetration Resistance (Blows/Inch) 20 40		Other Tests		
0 -	0.000	VALLEY FILL ALLUVIUM  0-0.4'-Sample. Recovered 0.4/0.4'=100%. CLAY: dusky yellowish brown (10YR 2/2); silty;		-			
	00:00	trace of granitic pebbles; poorly sorted; unconsolidated; damp.					
5-		Recovered 0.2/0.2'=100%. SAND: moderate yellowish brown (10YR 5/4); medium grained sand; clayey; moderately sorted; unconsolidated; angular;		<u>▼</u> → ∃			
-		damp.  0.6-7.0'-Sample. Recovered 0.0/6.4'=0%. Cuttings. BOULDERS:					
		granite and quartzite cobbles and boulders; wet.  ARAPAHOE FORMATION					
10 		7.0-9.5'-Sample. Recovered 2.5/2.5'=100%. CLAYSTONE: light olive gray (5Y 6/1); mottled iron staining; trace plant fossils; wet.					
		9.5-12.5'-Sample. Recovered 3.0/3.0'=100%. CLAYSTONE: Same as above; wet.					
- - - 15		TOTAL DEPTH: 12.5'					
			, , , ,	,,, <u>,</u> ,,			
20 Remarks	Logged by: L	. Pivonka		Checked by:	WP		

Project No.

106P06222

Hydro-Search, Inc.

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WELL	65–86	

	-0		WELL CONSTRUCTION SUMMARY							00 751	
				.OO.	N 34886.7 E 24389.5	ELEVATION: GROUN	ID LEVEL F CASING	57	82.75' 84.40'		
1	_ 2	羅		0.00	DRILLING SUMMARY:	CONSTRUCTION		LOG:	FIN	ISH	
				30000	TOTAL DEPTH Well: 8.00' Hole: 12.50'  BOREHOLE DIAMETER 72"	TASK DRILLING:	DATE 1986	TIME	DATE 1986	TIME	
	<b>–</b> 4			0000	DRILLER Boyles Brothers Drilling Co. 15865 W. 5th Avenue	기상" auger	9/13	_1112_	<u>9/13</u>	<u>1310</u>	
				0000	Golden, CO (Jim Horn)  RIG Mobile B-57	GEOPHYS. LOGGING:					
Pivonka	<b>-</b> 6			5000	BIT(S)Blade bit  ORILLING FLUIDNone	CASING: 2" stainless	9/13	1445	9/13	1450	
L. P.				90	SURFACE CASING 5" x 4' steel w/ locking cap	FILTER PLACEMENT:	9/13 9/13	1450 1510	9/13 9/13	1506 1523	
PERSONNEL .	_ 8				WELL DESIGN:  BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG	CEMENTING: CEVELOPMENT: OTHER:	9/16	1222	9/19	1451	
PERS	10			<b>医医室</b>	CASING STRING(S): C=CASING S=SCREEN  0.00' 2.50' C1	Bentonite	9/13 9/13 ———	1506 1435	9/13 9/13	1510 1445	
	<del>-</del> 10					WELL DEVELOR	PMENT		]		
	<b>–</b> 12			돌 돌	CASING: C1 2" I.D. Sch. 5 type 316 stain- less steel, threaded and flush	Ses Well Devel	opment :	Summary	Sheet.		
ts Plant	14				jointed.  SCREEN: SI 2" I.D. Sch. 5 type 316 stain-						
Rocky Flats Plant	<b>-</b> 14				less steel, threaded and flush jointed, 0.010" wire wrap screen 0.25' welded bottom cap.	COMMENTS: Water encounte	red at	4.50° di	uring di	illing.	
	- 16				CENTRALIZERS <u>Type 304 stainless steel</u> 4.79' - 5.93'	Top of stainle	ess stee	l casin	g: 1.6	5'	
					FILTER MATERIAL 32-42 silica sand 2.00' - 8.20'  CEMENT Portland Type I						
	- 18				0.00' - 1.50'  OTHER 3/8" bentonite pellets  1.50' - 2.00'						
	20	)			HYDRO-SEARCH RENO-DENVER	CONSULTING H	YDROL	OGISTS	-GEOL	DGISTS	

WELL	65-86
WELL	<u> </u>

## WELL DEVELOPMENT SUMMARY

DATE	TIME	METHOD	VOLUME	APPEARANCE	COMMENTS
9-16-86	1222				1 Well Bore Volume = .35 gals. 10 Well Bore Volumes = 3.5 gals.
9-16-86	1222	Bailed	ll gals.	Clear to light gray	Recharges quickly 11/3.5 gals. purged to date
9-17-86	1225	Bailed	6 gals.	Clear to light gray	Not recharging as quickly as on 9/16. 17/3.5 gals. purged to date
9-19-86	1451	Bailed		Clear to light gray	Sampled
·					
		· · · · · · · · · · · · · · · · · · ·			
		:			

AQUIFER TEST DATA

WELL 65-86

Type of Aquifer Test:

Bail down - Recovery

How @ Measured: 4.5 gallon bucket

How W.L.'s Measured: Olympic Well Sounder Measuring Point for W.L.'s: Top of Casing

Elevation of Measuring Point: 5790.2

Time:

Depth of pump/airline: N/A

Start bailing: 9/30/86

1007:00

Stop bailing: 9/30/86 Duration of Aquifer Test:

1010:00 Time: 14.25 minutes

TIME

WATER LEVEL DATA

Project No.: 106P06222

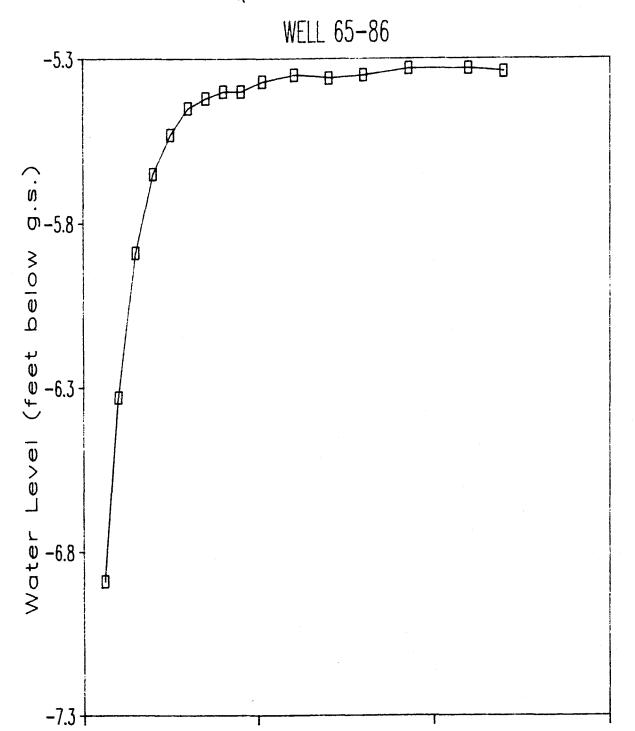
Location: Rocky Flats Plant

Personnel: W. Herst, D. Pavlick

COMMENTS

t = 3	at t' = 0		Water Level: 5.	
t	t'		Draw- down	
0		5.30		Begin bailing
2.3				1 gallon bailed
3.0	0			Stop bailing
3.6	.6	6.89	1.59	
4.0	1.0	6.33	1.03	Total depth = 7.25
4.5	1.5	5.89	.59	
5.0	2.0	5.65	.35	
5.5	2.5	5.53	. 23	
6.0	3.0	5.45	.15	90% recovered at 5.50
6.5	3.5	5.42	.12	
7.0	4.0	5.40	.10	
7.5	4.5	5.40	.10	
8.1	5. i	5.37	.07	
9.0	6.0	5.35	.05	
10.0	7.0	5.36	.06	
11.0	8.0	5.35	.05	
12.3	9.3	5.33	.03	
14.0	11.0	5.33	.03	
15.0	12.0	5.34	.04	Stop test

# AQUIFER TEST DATA



Time (min.)

#### Water Level Data for Rockwell (Rocky Flats)

Date Measured	Depth to Water from TOC	Elevation TOC (ft)	Water Level Elev. (ft)
** Well Number	r: 6586		
09/16/86 09/17/86 09/19/86 09/24/86 10/13/86 11/26/86 01/01/87 05/08/87 06/02/87 07/07/87 07/16/87 08/06/87 09/02/87 10/05/87 11/03/87	7.15 7.19 7.32 7.32 6.45 6.06 6.04 5.88 6.58 7.10 7.10 7.30 7.30 7.90 7.30 6.90 6.38	5784.40 5784.40 5784.40 5784.40 5784.40 5784.40 5784.40 5784.40 5784.40 5784.40 5784.40 5784.40 5784.40 5784.40 5784.40 5784.40	5777.25 5777.21 5777.08 5777.08 5777.95 5778.34 5778.36 5778.52 5777.82 5777.30 5777.30 5777.40 5777.40 5777.10 5777.50 5777.50

#### INDEX OF DATA

Boring	No.: 66-86
Comple	ted as well? Yes
Data in	File
<u> X</u>	Log of Borehole
X	Well Construction Summaries
<u> </u>	Well Development Summaries
	Hydraulic Conductivity Test Data
	and Results
	Packer Test Data and Results
<u> </u>	Water Level Data

Project:

Rocky Flats Plant

## LOG OF BORING NO.

Date Drilled 9/13/86

Boring Method Hollow Stem Auger

Coordinates N 33638.7 E 28151.6 Ground Surface Elevation 5685.12

Boring Method Hollow	Stem Auger Ground Surf	SCO FIGARIA	on 5085.12	
Elev. Depth Sample Graph (feet) (feet) Type Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	Containt 20 40	Other Tests
	VALLEY FILL ALLUVIUM  0-1.6'-Sample. Recovered 1.6/1.6'=100\$. GRAVEL: dark yellowish brown (10YR 4/2); granitic pebbles and cobbles with coarse to fine-grained sand; clayey; poorly sorted; subangular; unconsolidated; dry.  1.6-5.8'-Sample. Recovered 0.0/4.2'=0\$. Cuttings. BOULDERS: granite and quartzite cobbles and boulders; moist.  Wet at 4.5'  ARAPAHOE FORMATION  5.8-9.0'-Sample. Recovered 3.2/3.2'=100\$. CLAYSTONE: light olive gray (5Y 6/1); mottled iron staining; weathered; consolidated; damp.  9.0-12.0'-Sample. Recovered 3.0/3.0'=100\$. CLAYSTONE: Same as above; damp.		-	
	TOTAL DEPTH: 12.0'			
Remarks Logged by:	L. Pivonka		Checked by: _ , s	THE
Project No. 106P06222	Hydro-Search, In	nc.	Page 1 of 1	

WELL	66-86	

	Γ		9	WELL CONSTR	RUCTION S	UMM	IARY		
				LOCATION OF COORDS: ELEVATION: GROUND LEVEL					
			3,5	N 33638.7 E 28151.6		F CASIN	56	86.73'	····
	_2		ૃષ્ટ						
			۲.	DRILLING SUMMARY:	CONSTRUCTION			l =	
		<b>∭</b> ≣	٤	TOTAL DEPTH Well: 6.50' Hole: 12.00'	TASK	31	ART I	FIN	IISH I
			6.	BOREHOLE DIAMETER		<b>DATE</b> 1986	TIME	<u>DATE</u> 1986	TIME
	4		<i>چ</i> ا	DRILLER Boyles Brothers Drilling Co.	DRILLING: 7년" auger	9/13	1630	9/13	1706
	<b>F</b> "		100	DRILLER Boyles Brothers Driffing Co. 15865 W. 5th Avenue					
				Golden, CO (Jim Horn)					
			مط	RIG Mobile B-57	GEOPHYS. LOGGING:				_=_
g				BIT(S) Blade bit	CASING: 2" stainless	9/15	_0924	9/15	_0925
Pivonka	-6			DRILLING FLUID None	Z Stainless	9/13		<del></del>	
انا		*************		SURFACE CASING 5" x 4' steel w/ locking	FILTER PLACEMENT	9/15	0925	9/15	0933
  -			==		CEMENTING:	9/15	0935	9/15	0945
NNE	-8			WELL DESIGN:	DEVELOPMENT:	9/22	1315	9/24	1551
PERSONNEL	Ì		==	BASIS: GEOLOGIC LOG _X_ GEOPHYSICAL LOG	OTHER: <u>Bentonite</u>	9/15	_0933	9/15	_0935_
PE				CASING STRING(S): C=CASING S=SCREEN  0.00' 2.50' C1	Dentorite	9/15	0920	9/15	0924
				2.50' - 6.50' S1					
	Ho								<del></del>
1									
					WELL DEVELOR	PMENT			
	-12				<u>See Well Develo</u>	opment S	Summary	Sheet.	
				CASING: CI 2" I.D. Sch. 5 type 316 stain-					
뉨				<u>less steel, threaded and flush</u> jointed.		<del></del>			
Rocky Flats Pla				officed.					
ats	_14			SCREEN: SI 2" I.D. Sch. 5 type 316 stain-			····		<del></del>
国				less steel, threaded and flush	COMMENTS:			······································	
S				jointed, 0.010" wire wrap screen 0.25' welded bottom cap.	Water encounter	red at 4	.5' dur	ino dril	lino.
7	İ			CENTRALIZERS Type 304 stainless steel					
	_16			3.68' - 4.88'	Top of stainles	ss steel	casing	: 1.61	*
				FILTER MATERIAL 32-42 silica sand					
				2.00' - 6.80'					
1				CEMENT Portland Type I		i			
	- 18			0.00' - 1.50'				<u> </u>	
				OTHER <u>3/8" bentonite pellets</u> 1.50' - 2.00'					<del></del>
				6.80' - 12.00'					
	- 20		Ш	HYDRO-SEARCH RENOODENVER	CONSULTING H	/DROL(	GISTS-	-GEOLO	GISTS

PROJECT.

WELL	66-86
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## WELL DEVELOPMENT SUMMARY

DATE	TIME	METHOD	VOLUME	APPEARANCE	COMMENTS
9-22-86	1315				l Well Bore Volume = .21 gals. 10 Well Bore Volumes = 2.1 gals.
9-22-86	1315	Bailed	0.5 gal.	Clear	Trace of filter sand 0.5/2.1 gals. purged to date
9-23-86	1610	Bailed	0.2 gal.	Clear	0.7/2.1 gals. purged to date
9-23-86	0945	Airlifted		_	
9-24-86	1551	Bailed	0.1 gals.	Clear	0.8/2.1 gals. purged to date
9-25-86	1605	Bailed		Clear	Sampled
·					
			·		

#### Water Level Data for Rockwell (Rocky Flats)

Date Measured	Depth to Water from TOC	· ·	
** Well Numbe	er: 6686		
09/22/86	7.25	5686.73	5679.48
09/23/86	7.35	5686.73	<b>5679.38</b>
09/23/86	7.24	5686.73	5679.49
09/24/86	7.27	5686.73	5679.46
09/25/86	7.83	5686.73	5678.90
10/13/86	5.36	5686.73	5681.37
11/03/86	5.00	5686.73	5681.73
11/26/86	4.74	5686.73	5681.99
01/01/87	4.46	5686.73	5682.27
05/08/87	4.83	5686.73	5681.90
06/02/87	4.45	5686.73	5682.28
07/07/87	5.40	5686.73	<b>5681.3</b> 3
07/17/87	-1.00	5686.73	
08/06/87	7.30	5686.73	5679.43
09/02/87	7.20	5686.73	<b>5679.5</b> 3
09/08/87	7.90	5686.73	5678.83
10/01/87	6.20	5686.73	<b>5680.5</b> 3
11/03/87	5.00	5686.73	<b>5681.7</b> 3
12/01/87	4.77	5686.73	5681.96

#### INDEX OF DATA

Boring No.: 67-86					
Comple	ted as well? Yes				
Data in	File				
<u> X</u>	Log of Borehole				
<u>X</u>	Well Construction Summaries				
<u>X</u>	Well Development Summaries				
	Hydraulic Conductivity Test Data				
	and Results				
	Packer Test Data and Results				
X_	Water Level Data				

Project:

Rocky Flats Plant

## LOG OF BORING NO. 67-86

Date Drilled

9/16/86

Coordinates N 37702.2 E 28085.9

Boring Method Hollo	w Stem Auger Ground Su	rface Elevat	on 5796.26	
Elev. Depth Sample Graph (feet) (feet) Type Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	Content	Other Tests
	brown (10YR 4/2); granitic pebbles and small cobbles; clayey; poorly sorted; unconsolidated; moist.  1.5-5.0'-Sample. Recovered 1.6/3/5'=46%. GRAVEL: grayish orange (10YR 7/4); granitic pebbles and small cobbles;		▼	
	6.5-7.1'-Sample. Recovered 0.2/0.6'=33%. GRAVEL: grayish orange (10YR 7/4); silt, sand gravel and small cobbles abundant; unsorted;			
	unconsolidated; wet.  7.1-9.6'-Sample. Recovered 1.7/2.5'=68%. GRAVEL: moderate yellowish brown (10YR 5/4); fining upward sequence including fine-grained sand, coarse gravel and cobbles; abundant quartzite and granite; unsorted; unconsolidated; wet.	1 1 1 1		
	l by: L. Pivonka		Checked by:	WY.
Project No. 106P06222	Hydro-Search,	lnc.	Page 1 of 2	

LOG OF BORING NO. Project: Rocky Flats Plant Coordinates N 37702.2 E 28085.9 9/16/86 **Date Drilled Ground Surface Elevation** 5796.26 Hollow Stem Auger **Boring Method** Penetration Resistance Other Tests Elev. Depth Sample Graphic (feet) (feet) Type Log Material Description (Blows/Inch) 20 40 9.6-12.1'-Sample. Recovered 1.4/2.5'=56%. GRAVEL: Same as above: sandy; wet. 12.1-14.0'-Sample. Recovered 0.0-1.9'=0%. Cuttings. GRAVEL: granite and quartzite cobbles; wet. 30 멀다 00,0 ARAPAHOE FORMATION 14.0-15.0'-Sample. Recovered 0.0/1/0!=0. Cuttings. CLAYSTONE. 15.0-16.5'-Split Spoon. Recovered 1.5/1.5'=100%. CLAYSTONE: light olive gray (5Y 6/1); mottled iron staining; weathered; moist. 15.0' TOTAL DEPTH: 16 Checked by: Logged by: L. Pivonka Remarks

Hydro-Search, Inc.

Page 2 of 2

Project No.

106P06222

WELL	67-86	
WEL	6/-86	

	+			0	WELL CONST	RUCTION S	UMN	1ARY	•	
				000	LOCATION or COORDS: N 37702.2 E 28085.9	ELEVATION: GROU TOP C	ND LEVE OF CASIN		'96.26' '97.73'	
	-2		=		DRILLING SUMMARY: TOTAL DEPTH Well: 14.75' Hole: 15.00'	CONSTRUCTION		LOG:	FIN	ISH
				000	BOREHOLE DIAMETER	TASK DRILLING:	<u>DATE</u> 1986	TIME	<u>DATE</u> 1986	TIME
	4				DRILLER Boyles Brothers Drilling Co.  15865 W. 5th Avenue  Golden, CO (Jim Horn)	7½" auger 7½" casing advancer	9/15 9/17	0930 0800	<u>9/15</u> <u>9/17</u>	1730 1758
Pivonka	-6				RIG Mobile B-57 BIT(S) Blade bit  DRILLING FLUID None	GEOPHYS LOGGING: CASING: 2" stainless	9/17	1300	9/17	1305
ľ.	_8			South Soig		FILTER PLACEMENT: CEMENTING: LEVELOPMENT:	9/17 9/17 9/22		9/17 9/17 9/25	1535 1555 1515
PERSONNEL	<b>⊣</b> 0				BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG  CASING STRING(S): C=CASING S=SCREEN  0.00' 2.50' C1  2.50' - 14.75' S1	OTHER: Bentonite	9/17	_1535 	9/17	1540
Plant	<b>⊣</b> 12	-		00000000000000000000000000000000000000	CASING: C: 2" I.D. Sch. 5 type 316 stain— less steel, threaded and flush jointed.	WELL DEVELOP  See Well Develo		Summary	Sheet.	
Rocky Flats Plan	-14			us. In the same	SCREEN: SI 2" I.D. Sch. 5 type 316 stain— less steel, threaded and flush jointed, 0.010" wire wrap screen 0.25' welded bottom cap.  CENTRALIZERS None (see comments)	COMMENTS: Water encounter	ed at 3	.0' dur	ing dril	ling.
	_16 -18				FILTER MATERIAL 32-42 silica sand 2.00' - 15.00'  CEMENT Portland Type I 0.00' - 1.50'  OTHER 3/8" bentonite pellets	Top of stainles Well built throcentralizers use	ugh cas			
	-20				HYDRO-SEARCH RENO-DENVER	CONSULTING HY	DROLO	GISTS-	GEOL O	GISTS

Colden, CO

LOCATION

Rocky Flats Plant

106P06222

PROJECT

WE	:1	1	67-86
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## WELL DEVELOPMENT SUMMARY

DATE	TIME	METHOD	VOLUME	APPEARANCE	COMMENTS
9-22-86	1500				l Well Bore Volume - 1.7 gals. 10 Well Bore Volumes = 17 gals.
9-22-86	1500	Bailed	36 gals.	Light to medium to dark brown	Slightly viscous 36/17 gals. purged to date
9-23-86	1040	Airlifted		Brown, turbid	Viscous, sandy Hydrofracted surrounding area
9-24-86	1615	Bailed	40 gals.	Brown, turbid	76/17 gals. purged to date
9–25–86	1515	Bailed	40 gals.	Light medium brown, turbid	116/17 gals. purged to date
10-3-86	1455	Bailed	24 gals.	Bottom 3'-clear Top 3'-light brown	140/17 gals. purged to date

12/11/87

#### Water Level Data for Rockwell (Rocky Flats)

Date Measured	Depth to Water from TOC	Elevation TOC (ft)	Water Level Elev. (ft)
** Well Numbe	r: 6786		
09/25/68	4.13	5797.73	5793.60
09/22/86	4.43	5797.73	5793.30
09/23/86	3.86	5797.73	<b>5793.8</b> 7
09/24/86	4.19	<b>5797.</b> 73 .	5793.54
10/03/86	3.77	5797.73	<b>5793.</b> 96
10/13/86	4.59	5797.73	5793.14
01/01/87	11.83	5797.73	<b>5785.</b> 90
05/07/87	9.42	5797.73	5788.31
06/01/87	10.20	5797.73	<b>5787.</b> 53
06/01/87	7.20	5797.73	<b>5790.5</b> 3
07/07/87	12.10	57 <del>9</del> 7.73	5785.63
07/20/87	12.90	5797.73	5784.83
08/06/87	13.50	5797.73	5784.23
09/01/87	14.40	5797.73	5783.33
10/22/87	14.80	5797.73	5782.93
11/09/87	14.80	5797.73	5782.93
12/01/87	14.75	5797.73	5782.98